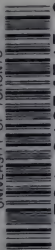


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THE
NEW SYSTEM OF GYNAECOLOGY



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THE NEW SYSTEM OF GYNAECOLOGY

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VOLUME II

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DISEASES OF THE VULVA

By COMYNS BERKELEY, M.C., M.D. (Cantab.),
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THE vulva may be inflamed, ulcerated, the seat of a swelling, the site of some congenital or acquired defect or of an injury.

Inflammation of the Vulva

Acute Vulvitis.—*Cause.*—Acute vulvitis is generally gonorrhoeal in origin, but it is occasionally due to injury caused by a douche, the temperature of which was too high or the chemical it contained too strong, or to the septic infection of a wound of the vulva caused during labour or otherwise.

Symptoms.—The patient complains of a profuse discharge and of heat, swelling, and pain in the vulva. Pain and swelling in the groins and scalding on micturition may also be present.

Signs.—The labia are swollen, tender, and red, and there is a profuse purulent discharge covering the affected parts. The orifices of the urethra and Bartholin's ducts may be inflamed and red. The special characters of gonorrhoeal vulvitis are described in the Article on Gonorrhoea (Vol. I. p. 567).

Diagnosis.—The nature of the infecting organisms should be ascertained by a bacteriological examination of a specimen of the discharge. Apart from the detection of the gonococcus, gonorrhoea may be suspected if the vulvitis was sudden in its onset and the inflammation very acute, so that the pain and swelling are particularly marked. A very profuse and green discharge is highly suggestive of gonorrhoea, and infection of the inguinal glands, urethra, and Bartholin's ducts all point strongly to such an origin.

The complications mentioned in Vol. I. p. 574 are also liable to follow an attack of gonorrhoeal vulvitis.

Treatment.—The patient should sit, three times a day for half an hour, in a hot bath with the water up to her waist, and between whiles lint soaked in boric acid or lead lotion, ʒi to Oj, should be applied over the vulva and between the labia. When the acute attack has subsided the labia may be painted with melargen 10 per cent. Vaginal douches should not be prescribed owing to the danger of infecting the vagina secondarily. Gonorrhoeal urethritis should be treated by the application of a 5 per cent solution of a silver salt on a Playfair's probe.

Chronic Vulvitis.—*Cause.*—Chronic vulvitis is most commonly associated with pruritus vulvae (see p. 35), the abrasions due to the scratching becoming infected. In children vulvitis at times occurs without any apparent cause, although the most careful search may be made. It may be due to uncleanness, irritating discharges, and contamination with faeces and urine.

Symptoms.—The patient complains of itching, soreness, and a slight discharge.

Signs.—The vulva is not appreciably swollen. Abrasions and an eczematous condition will be found on the vulva and perhaps the inner surfaces of the thighs. There is a slight muco-purulent discharge.

Diagnosis.—An examination of the vulva based on the list of causes enumerated under pruritus vulvae (p. 35), should be made. It is also most important that the urine should be examined for sugar.

Treatment.—The cause, if identified, should be treated. If the cause is not detected, the various lotions and applications mentioned under pruritus vulvae should be tried.

Gangrenous Vulvitis.—*Cause.*—Gangrene of the vulva is a very rare disease. It may be caused by the infection of a wound of the vulva as in puerperal infection; it may be associated with erysipelas, diphtheria, and venereal disease of the vulva, and with the acute specific diseases, more especially smallpox and typhus. A very rare and fatal variety, noma, is occasionally found in children, the subject of one of the acute specific fevers, generally measles.

Symptoms.—The patient complains of severe pain, and has the symptoms associated with toxic absorption to a marked degree.

Signs.—The disease is usually unilateral. The labium is swollen and black, and ulceration and gangrene quickly supervene. In noma a dark indurated spot appears followed by vesicles, bullae, and ulceration, and terminating in gangrene, which quickly spreads to the adjacent tissues.

Treatment.—The patient must be anaesthetized and the gangrenous tissue removed, after which pure nitric acid should be applied to the raw surface. Further

local treatment consists in the application of hot carbolie fomentations and frequent swabbing with a solution of peroxide of hydrogen 10 volumes.

The strength of the patient must be sustained, and if the infective organism can be identified serum treatment may be employed.

Membranous Vulvitis.—*Cause.*—Membranous vulvitis may be due to infection by the diphtheria bacillus, or to a necrosis of the superficial tissues of the labia due to a streptococcal infection.

Symptoms.—The patient complains of pain, and the further symptoms vary with the nature of the disease.

Signs.—The labia are swollen and inflamed, and at one or more points on them a membrane can be seen. The membrane of diphtheritic vulvitis is grey or greenish in colour; it may cover the whole or part of the labia and is detached in very small pieces. The membrane of necrosis is yellow and comes away in large pieces, and is composed of a layer of squamous epithelium.

Diagnosis.—A bacteriological examination should be made for the Klebs-Löffler bacillus and the streptococcus. If the patient has diphtheria of the throat the nature of the membrane on the vulva may be taken for granted.

Treatment.—Strong antiseptic lotions of carbolie acid or biniodide of mercury should be applied locally, and if the disease is diphtherial in origin, antidiphtheritic serum should be injected.

Erysipelatous Vulvitis.—*Cause.*—This disease is due to infection by the *streptococcus pyogenes*. In pre-antiseptic days erysipelatous vulvitis was a fairly common complication of wounds of the vulva, especially those associated with child-birth. It is now rarely seen.

Symptoms.—The disease commences with a rigor and there is high fever with its attendant symptoms. The patient complains of itching and burning of the affected part.

Signs.—The vulva is swollen, very tender, and deep red in colour. The margin of the inflamed area is raised, and small blisters or vesicles may be noted. An abscess of the labium may also form.

Treatment.—The strength of the patient must be sustained, alcohol being prescribed if necessary. *Liquor ferri perchloridi* ℥ 30, *Aquam chloroformi* ad ʒi should be given every four hours for a few days. Locally warm antiseptic fomentations should be applied.

Herpetic Vulvitis.—*Symptoms.*—The patient complains of severe pain preceding the eruption and of marked itching when it has developed.

Signs.—The vesicles which generally appear on one labium majus are arranged

in groups. Several vesicles may coalesce with the result that bullae are formed. The vesicles become pustular, rupture, and then dry up.

Treatment.—Boric acid ointment or an ointment of bismuth carbonate $\bar{5}i$ and lanolin $\bar{5}i$ spread on lint should be applied to the affected part.

Aphthous Vulvitis.—*Cause.*—This disease is due to infection of the labia by the *oidium albicans*, and generally occurs in badly nourished children, or in women when pregnant, or towards the termination of some long and fatal illness, such as phthisis or cancer.

Symptoms.—The patient complains of pain and slight swelling of the vulva.

Signs.—Small, white, slightly raised patches surrounded by red areas are seen. These white patches are not easily detached, but when they are removed a small ulcer with a reddened base appears. The patches consist of the mycelium of *oidium albicans*.

Treatment.—The general health must be attended to, and locally, compresses of biniodide of mercury 1 in 4000 will usually suffice.

Eczematous Vulvitis.—*Cause.*—This condition is associated with pruritus vulvae (see p. 35).

Symptoms.—The patient complains of intense itching, of pain, and of a discharge.

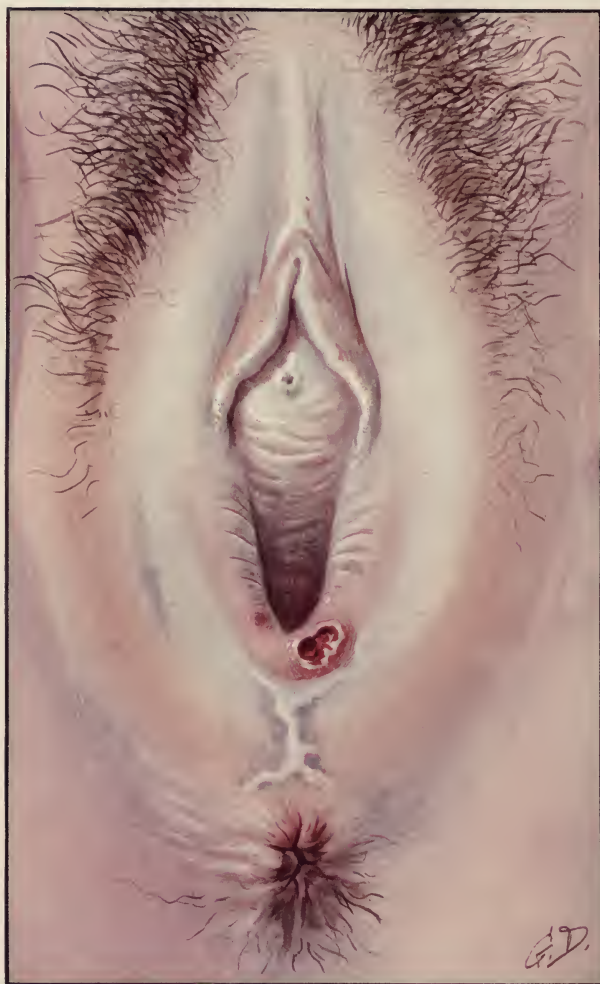
Signs.—The extent of the eczema varies with the length and severity of the attack. A solitary patch may be found, or the whole of the vulva, including the mons veneris and perineum and the adjacent surfaces of the thighs, may be raw and discharging from the constant scratching induced by the excessive irritation.

Treatment.—A most careful search should be made for the cause which, if ascertained, should be appropriately treated. The patient may sit in a bath, for half an hour, to which an ounce of carbonate of potash and carbonate of soda have been added, the temperature of the water being from 90° to 95° F. This will relieve the itching, and afterwards one or other of the following preparations may be applied, on lint, to the vulva :

R Calaminae Preparatae, gr. 40.
Zinci Oxidi, gr. 30.
Aquae Calcis,
Olei Olivae, aa, $\bar{5}ss$.

R Liquoris Plumbi Subacetatis, $\bar{5}i$.
Acidi Salicylici, gr. 2.
Lac ad $\bar{3}ii$.

R Zinci Oxidi,
Pulveris Amyli, aa, gr. 120.
Vaseline, $\bar{5}ss$.
Acidi Salicylici, gr. 10.



LEUKOPLAKIC VULVITIS

Carcinomatous ulcers have developed at the posterior parts. The urethral orifice and adjacent parts of the vagina are wrongly represented as affected by the disease. (Author's case).

Ointments containing boric acid, or oxide or carbonate of bismuth, are sometimes useful and dusting powders of starch and calamine may be tried.

Leucoplakic Vulvitis.—Leucoplakic vulvitis is a chronic inflammatory condition of unknown origin, characterized in its early stages by marked hyperaemia and cellular activity, and in its later phases by marked epithelial hypertrophy and a thickened sclerosed and retracted condition of the subepithelial tissue.

Cause.—The cause of leucoplakic vulvitis is not known. In the large series of cases reported by Berkeley and Bonney¹ there was no history or antecedent sign of syphilis, nor could evidence of the presence of the spirochaete be obtained by histological methods. The disease generally appears at or after the menopause.

Symptoms.—The most striking symptom of leucoplakic vulvitis is pruritus, which, in the first and second stages, is very marked. In the third stage, owing to the exposure of the nerve-endings in the floor of the ulcer or crack, there is pain, and in the fourth stage all symptoms disappear.

Signs.—The vestibule and the orifice of the urethra are never affected. With these exceptions any part or the whole of the vulva may be the seat of the disease, which may even spread on to the folds of the thighs and round the anus.

In the first stage the parts affected are red, swollen, excoriated, and dry. In the second stage, the labia minora retract and thicken, and the colour of the affected part changes from red to a semi-opaque white. In the third stage, cracks and ulcers appear, which give rise to a slight discharge and may bleed on being touched. At this stage carcinoma commonly becomes engrafted on some portion of the diseased area, most often on an ulcer or crack. If carcinoma does not supervene a fourth stage is noticed, in which the labia minora and clitoris practically disappear and the rest of the vulva becomes smooth, shiny, and white. (See Plate I. Vol. II.)

Pathology.—Different parts of the diseased area may be respectively in different pathological stages at the same time. In the *first stage* the epithelium is swollen and the individual cells are less firmly attached to one another, so that the desquamation of the superficial cells is excessive. The subepithelial tissue is abnormally vascular, and is crowded with lymphocytes, some of which have intercalated themselves between the cells of the basal layers of the epithelium. Few or no polynuclear leucocytes are to be seen, and the fixed tissue cells of the part have not been proliferated. In the *second stage* the type of the subepithelial tissue cell-proliferation begins to alter. Lymphocytes are still conspicuous objects, but besides these are groups of plasma-cells and an increased number of large hyaline fixed connective-

¹ *Trans. Roy. Soc. Med. (Obst. and Gyn. Sect.)*, vol. iii. p. 29.

tissue cells normal to the part. The sustentacular elements become altered, the white fibres become decollagenized and more hyaline in appearance; whilst the elastic fibres have in many places completely disappeared over a certain subsurface area, so that a definite zone of de-elasticized and hyaline-looking tissue intervenes between the epithelium and the normal tissues deeper down. That many or all of the lymphocytes seen in the microscopic field are produced in the diseased area is proved (1) by the absence of these cells in the cross-sections of blood-vessels, and (2) by the appearance at this stage of definite new lymph-nodes in the subepithelial tissue, which contain germinal areas showing karyokinesis and are not normally present there. The appearance of these new lymph-nodes is very interesting, because they are commonly found in the neighbourhood of carcinoma, to which disease the condition under discussion bears, as already stated, a very close relation. The origin of the plasma-cells is undoubtedly local. They appear to be developed from certain elongated nuclei found in resting connective tissue. The large hyaline fixed tissue cells proliferate both mitotically and amitotically from similar cells normally found in the part, and the same may be said of endothelial cells. The epithelium at this stage is markedly hypertrophied and many karyokinetic figures can be seen in it. The hypertrophy is chiefly of the basal layers, and the interpapillar processes of the epithelium are much elongated. The surface-cells, on the other hand, still show a tendency to early desquamation, which reaches its maximum in the numerous shallow ulcers and fissures that beset the diseased area. At these points so great has been the shedding of the superficial epithelium that the apices of the elongated papillae of the corium almost reach the surface. It is also noteworthy that the inflammatory cells already described—and particularly the lymphocytes—tend to aggregate round the tips of the interpapillar epithelial processes. In the *third stage*, the cellularity of the subepithelial tissue begins to give place to fibrosis. Many of the inflammatory cells disappear; collections of lymphocytes and plasma-cells are still scattered over the field. A redeposit of collagen occurs round the fibroglia fibres of the fixed tissue cells, which, in the preceding stage, have been greatly increased in number, so that the tissue, from being unduly rarefied, now becomes denser than normal. The hypertrophy of the epithelium is still maintained, but the growth-tendency now appears to be directed upwards, resulting in the formation of a dense mass of keratinized squames, whilst the interpapillar downgrowths are disappearing, so that the epithelium rests on the sclerosed subepithelial tissue more as a flat sheet. There is a total absence of yellow elastic tissue in the sclerosed subsurface zone. In the *fourth stage* the sclerosis of the subepithelial tissue is complete. Very few cells are to be seen under the epidermis. Such

as are present are of the fixed connective-tissue type. The subepithelial zone of de-elasticized tissue is of less depth, but denser. The epithelium, probably starved by the increasing fibrosis going on underneath it, becomes thinner, whilst the cells show an early tendency to keratinization.

Diagnosis.—Leucoplakic vulvitis is an entirely different disease from *kraurosis vulvae*, with which it is often confused. A reference to the pathology, parts affected, and after-results as described under the two diseases makes this quite clear.

Whether an ulcer or fissure associated with the third stage of leucoplakic vulvitis is malignant or not is settled by microscopic examination.

Prognosis.—A certain number of cases pass on to the fourth stage, the remainder develop carcinoma of the vulva.

Relation of Leucoplakic Vulvitis to Carcinoma of the Vulva.—There is both clinical and pathological evidence that leucoplakic vulvitis is an antecedent condition and cause of carcinoma of the vulva. In any case of carcinoma of the vulva, not too far advanced, evidence of leucoplakic vulvitis can be determined. When a carcinoma of the vulva crosses the middle line it rarely does so by way of the vestibule, the vestibular mucosa, as already pointed out, not being subject to leucoplakic vulvitis. When true multiple growths of the vulva are present, it will be found that the mucosal surface separating them is the seat of leucoplakic vulvitis. * Unless the lines of incision for removal of the vulva for leucoplakic vulvitis are so planned as entirely to lie without the diseased area, the leucoplakic condition returns in the scar, and carcinoma may be found engrafted thereon. The pathological evidence shows that in leucoplakic vulvitis the maximum hypertrophy of the interpapillar epithelial processes occurs in the second stage, *i.e.* that in which the cellularity and rarefaction of the subepithelial tissues are also at their maximum. It is in this stage that the supervention of carcinoma is to be feared. It begins over a variable area as an increasing hypertrophy of the interpapillar epithelial processes, whereby they penetrate more and more deeply to the underlying connective tissue. The connective-tissue papillae are more than correspondingly elongated, so that they reach much higher than normal, but they are thinned and compressed. It would appear that the growth-energy of the epithelial cells becomes confined to those deep down in the interpapillar processes, while the more superficial cells, on the contrary, are of feeble vitality, loosely attached to one another, and actually desquamate before keratinization can occur. Thus the elongated papillar processes of the corium eventually reach the free surface, which now bleeds readily, from punctate points corresponding to their apices. The condition may be likened to an area of skin after a Thiersch graft has been removed. This absence of keratinization and early

desquamation of the surface-cells of a squamous-celled carcinoma is very striking, and contrasts markedly with the condition found in a papilloma.

The epithelial downgrowths, which are at first simply the enlarged pre-existing interpapillary processes of the epidermis, later become branched and tortuous. This development of squamous-celled carcinoma from hypertrophied pre-existent interpapillary processes has been shown by Bonney¹ to be a constant feature of the disease wherever its site, for even in positions such as the vaginal cervix, in which normally no papillae or interpapillary processes exist, a series of such are always formed previous to the onset of squamous-celled carcinoma there, as a result of the chronic cervicitis which is its invariable antecedent. The formation of interpapillary downgrowths of epithelium would appear to be an adaptation to relieve lateral growth tension, for it is certain that in all conditions of hypertrophy of the lower strata of an epidermis they either appear *de novo* (cp. chronic cervicitis) or, if normally existent, become much exaggerated (cp. the skin). Further, it would appear that so long as the growth-energy of the epithelial cells is evenly distributed along the length of the epidermis, enormous hypertrophy may take place without malignancy. But, that, when the growth energy becomes concentrated at a series of points corresponding to each interpapillary process, a want of co-ordination is established which at once makes the condition dangerous.

The relation between the malignant epithelial ingrowth and the altered state of the subepithelial tissues is an important subject. In leucoplakic vulvitis two sets of phenomena are going on simultaneously, namely those in the epithelium and those in the connective tissue. In both of them an accession of cellular energy takes place, which then declines and finally gives place to a state of cellular activity and reproduction much below the normal. But a study of the earliest stages of the disease shows that the activity of the connective-tissue cells is that first awakened, the growth of the epithelial cells initially being actually inhibited. Thus it comes about that a profoundly altered state of the subepithelial tissue anticipates the occurrence of epithelial hypertrophy.

Further, it would appear that a condition of rarefaction and cellularity of the subepithelial tissue is an important factor, influencing epithelial ingrowth. For in the earliest phases of carcinoma of the vulva in which the epithelial ingrowth is only as yet foreshadowed, the connective-tissue cell proliferation around this area is already typical of that seen in the developed disease. The disappearance of elastic tissue in the area of a commencing carcinoma is very striking. On the other hand, there is evidence to show that an excess of these fibres probably acts as a check

¹ *Report Cancer Research Laboratories Middlesex Hospital, 1908.*

to epithelial ingrowth. In certain very chronic types of the disease in which the subepithelial changes never reach a high degree of cellularity, a great excess of elastic tissue may be found. In the later stages of this condition considerable epithelial hypertrophy occurs, but without those long interpapillary downgrowths which are the first indications of approaching malignancy. Further, the more benign papillomatous type of carcinoma of the vulva shows less destruction of elastic tissue than the more malignant ulcerative form. Dense sclerosis of the white fibrous elements also probably checks epithelial ingrowth, and, as this progresses in the later phases of leucoplakic vulvitis, the tendency to carcinoma becomes increasingly diminished.

Of the cellular elements in the connective tissue the plasma-cells are those which most characterize the second stage of leucoplakic vulvitis, and these are also the predominant tissue-cells in carcinoma of the vulva. They bear this relation to the initiation of epithelial ingrowth, namely that they are largely responsible for the decollagenization of the subepithelial tissue which occurs in the antecedent leucoplakic vulvitis. Though changes in the adjoining connective tissue bear some very close relation to the cause of epithelial ingrowth, yet, malignancy having been established, the further spread of the tumour is independent of such assistance. The condition of the connective tissues surrounding an advanced inrunner of carcinoma-cells is one of passivity, and the same is true of the tissue surrounding permeated lymphatics and metastatic growths as was pointed out by Sampson Handley,¹ excepting those in lymphatic glands, which are an exception to this rule.

Treatment.—In the first and second stages the various remedies enumerated under pruritus vulvae may be tried. Failing relief by one or other of these remedies, the affected part should be excised. Such treatment is indicated, if, when the patient is first seen, the third stage is present, and it is important for the reasons already given that the excision should be quite free of the affected area.

Kraurosis Vulvae.—Kraurosis vulvae consists of an atrophic condition of the vulva, associated clinically with stenosis of the vaginal orifice and pathologically with certain changes in the dermis.

Cause.—Cases of kraurosis vulvae may be divided into three groups: (1) those in young women associated with sterility, (2) those occurring at or after the menopause, (3) those occurring after operations involving the removal of the ovaries. It is probable that deficiency or absence of some ovarian factor in the economy of the organism plays an important part in the causation of the disease.

Symptoms.—In the *first stage* the parts are extremely sensitive. The patient

¹ "Hunterian Lecture," Royal College of Surgeons, 1905.

complains of soreness, pain, dyspareunia, and painful micturition. Of these dyspareunia is the most marked. In the *second stage* the soreness may disappear but the dyspareunia increases.

Signs.—The labia minora, vestibule, and the orifices of the urethra and vagina become affected. The rest of the vulva and adjacent surfaces of the thighs always remain free.

In the *first stage* the diseased area is red and glistening, and dotted over it, especially on the hymeneal remains, may be purple patches varying in size up to that of half a split-pea. A caruncular condition of the urethra may also be present.

In the *second stage* the surface becomes pale, yellow, glistening, and perfectly smooth. The labia minora and clitoris disappear; the mons veneris atrophies and the pubic hair falls out. The vaginal orifice contracts so that it may be difficult to make a vaginal examination (Fig. 1).



FIG. 1.—The external genitalia, showing atrophy due to kraurosis.

Pathology.—The epithelium is everywhere thinner than normal, and the papillae and interpapillary processes are atrophic and in places have entirely disappeared. The subepithelial connective tissue exhibits marked cellularity, but of a patchy kind. In the areas of a section which correspond to the red patches seen on the surface of the mucous membrane, a

very considerable, and in places even massive, proliferation of plasma-cells is seen immediately under a thinned and flattened epithelial layer. Surrounding the plasma-cell proliferation, or partly mixed with it, both lymphocytes and polymorphonuclear leucocytes are seen. The lymphocytes are the more deeply placed, and as the surface is approached the polymorphonuclear leucocytes become increasingly predominant. In the rest of the section simple thinning of the epithelium is manifest, with a certain number of polymorphonuclear leucocytes, lymphocytes, and plasma-cells in the connective tissue which underlies it. One of the most striking features is the intercalation of polymorphonuclear leucocytes between the epithelial

cells. When stained for elastic tissue the sections show that this is present in all parts save where massive accumulations of plasma-cells have occurred.

Diagnosis.—Kraurosis vulvae is often confused with leucoplakic vulvitis. It is quite a different disease alike in its pathology, site of incidence, and behaviour. It is in no way connected with carcinoma of the vulva.

Prognosis.—The symptoms of kraurosis vulvae, except dyspareunia, eventually disappear.

Treatment.—The various lotions and ointments mentioned under pruritus vulvae may be tried. In the first stage, the tender red patches can be cauterized or excised. The dyspareunia of the second stage can be remedied by a plastic operation similar to that described for vaginismus.

Follicular Vulvitis.—*Cause.*—This condition is most often found complicating pregnancy, less frequently gonorrhoea. Uncleanliness and irritating discharges appear to be the cause.

Symptoms.—The patient complains of severe pruritus and leucorrhoea.

Signs.—The hair-follicles, the sebaceous and sweat-glands are affected, forming small reddish elevations often containing a drop or so of pus.

Treatment.—The cause should, if possible, be ascertained and treated. Antiseptic compresses should be applied. If this treatment is not successful the follicles should be punctured, a few at a time, and melargen¹ 10 per cent painted over them afterwards.

Abscess of Bartholin's Gland.—Abscess of a Bartholin's gland may be due to gonorrhoeal or septic infection. In nearly every case it is the gonococcus that is the infecting organism. A Bartholin's cyst may become infected in a like manner.

Symptoms.—The symptoms will vary according to the amount of inflammation present. If the gland is chronically inflamed, the patient will complain of a swelling in the posterior part of the labium majus which varies in size and in the severity of the pain it causes. There will be intermittent attacks of pain associated with an increased swelling in the gland, followed by a slight discharge and a temporary alleviation of the symptoms. If the duct becomes obstructed or the inflammation is more acute an abscess results. In this case the patient complains of very severe pain and burning in the vulva, and of inability to walk or sit with any comfort. The symptoms of fever will be present, in most cases there is a vaginal discharge, and in gonorrhoeal infections the patient generally complains of pain on micturition.

Signs.—The abscess forms a very tender swelling in the posterior part of the labium majus; owing to the induration around the gland, fluctuation is not easily

¹ Melargen (Mellin) and nargol (Parke, Davis, & Co.) are British substitutes for the German product protargol.—EDITORS.

obtained. The skin of the labium covering the abscess has at first a normal appearance, and it is only after some time that it becomes red and oedematous. If not treated the abscess eventually bursts on the inner side of the labium. There is a rise of temperature.

In chronic inflammation the gland can be felt somewhat enlarged and tender. The orifice of the duct is reddened and it may be possible to press a little pus from it.

Diagnosis.—An abscess of Bartholin's gland has to be distinguished from suppuration in the labium due to infection of a haematoma, to cellulitis, or to an ischio-rectal abscess which may track into the labium. The situation of the swelling, together with the history and symptoms and signs pointing to an attack of gonorrhoea, will suggest the nature of the disease.

Treatment.—An incision must be made into the abscess and the pus evacuated. The abscess cavity should then be swabbed with carbolic acid, after which it should be packed and douched daily.

Inflammation of the Hymen.—*Cause.*—Inflammation of the hymen results from gonorrhoeal or septic infection and is most commonly associated with laceration at the first coitus.

Symptoms.—The patient complains of pain and severe dyspareunia leading to vaginismus.

Signs.—The hymen and adjacent parts are found to be red, the hymen is extremely tender, and in the cases due to coitus one or more lacerations may be seen.

Treatment.—The treatment of inflammation following the lacerations of coitus is described under dyspareunia. In other cases the inflammation should be treated with vaginal douches of boric acid or lead lotion.

ULCERATION OF THE VULVA

Ulceration of the vulva may be traumatic, syphilitic, tuberculous, carcinomatous, or sarcomatous in nature; it may also be due to esthiomène. The vulva of children who have had one of the acute specific fevers may be the seat of small ulcers, and severe ulceration and gangrene is found in noma. Small, very tender ulcers are also found in the late stages of leukoplakia and very frequently become malignant.

Traumatic Ulceration.—*Cause.*—The vulva may be injured as the result of child-birth, accident, assault, or coitus. The wounds thus caused may become infected and ulceration result.

Symptoms.—The patient will complain of pain and swelling in the vulva and of a discharge.

Signs.—In most cases the lesion can be at once identified, the labium is swollen,

red, and tender, and the ulcer can be seen. If the condition is due to coitus the most likely site for the ulceration will be found in the fossa navicularis, and as the ulcers are generally small their presence may not be noted unless great gentleness is used in the examination.

Treatment.—The ulceration should be treated with antiseptic lotion and hot fomentations if necessary. The traumatic ulcers due to coitus are best treated by cauterization or excision.

Tuberculous Ulceration.—Tuberculous ulceration of the vulva is rare. For its description the reader is referred to the Article on Tuberculous Disease (Vol. I. p. 589).

Syphilitic Ulceration.—The ulceration occurring on the vulva in primary, secondary, and tertiary syphilis is dealt with in the Article on Syphilis (see Vol. I. p. 671).

Ulceration due to Carcinoma, Sarcoma, Esthiomène.—For a description of these ulcerations the reader is referred to the section dealing with these conditions.

CYSTIC SWELLINGS

Cyst of the Labium Majus. Bartholin's Cyst.—*Cause.*—This retention cyst is due to an obstruction, of inflammatory origin, in the duct. Cystic dilatation of the duct may be present if the site of the obstruction is near the orifice of the duct; this is the commonest variety of cyst. If the obstruction in the duct is near its junction with the gland, the latter structure becomes cystic.

Symptoms.—If the cyst is of sufficient size or the condition is bilateral, the patient will complain of discomfort, if married of dyspareunia, and if it becomes inflamed, of pain. A history of an antecedent vaginal discharge can usually be obtained.

Signs.—The cyst is situated in the posterior third of the labium majus, and has the labium minus spread over it. It is somewhat pear-shaped, the narrowest part of the swelling lying uppermost. The mucous membrane covering it is normal, and it is not tender unless it is inflamed. The cyst contains a watery or viscid fluid.

Pathology.—If the cyst is due to an obstruction of the duct near its orifice, the cyst-wall will be found to be very thin and lined with one or more layers of squamous epithelium, whilst the gland itself is flattened out on one side of the cyst. If the gland is cystic, the cyst-wall consists of connective tissue and is lined with cylindrical cells.

Diagnosis.—A Bartholin's cyst must be diagnosed from a hydrocele of the canal of Nuck, from a vulval haematoma and from an inguinal hernia. The special features of the two former swellings are indicated under the respective heads of these

diseases. From an inguinal hernia a Bartholin's cyst is diagnosed as follows: The patient will complain of a swelling in the vulva, which may or may not always be present, and of a dragging pain and backache especially after exercise.

The swelling appears in the *upper part* of the labium majus. If it is caused by intestine it will be elastic on palpation and resonant on percussion, whilst, if omentum is present, it will have a doughy consistence and be dull on percussion. It may be



FIG. 2.—Cyst of Bartholin. Incision over the cyst.

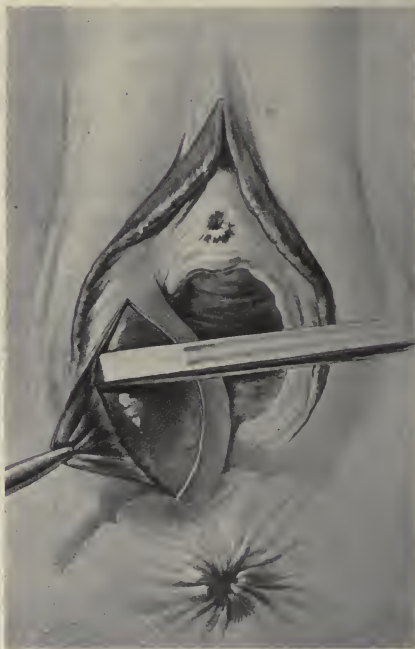


FIG. 3.—Cyst of Bartholin. Enucleation of cyst with handle of dissecting forceps.

possible to reduce the swelling, and if so the intestine will slip back with a gurgle. The swelling may also disappear when the patient lies down. The ovary or uterus is at times found in the sac. If the hernia is irreducible it may present very similar features to that of an encysted hydrocele especially if the sac contains omentum.

Treatment.—An incision is made over the cyst from above downwards at the junction of the skin and mucous membrane (Fig. 2). The cut edges of the skin and mucous membrane are retracted with forceps and the cyst separated from the surrounding connective tissue by careful dissection with the scissors, scalpel, or

handle of the scalpel (Figs. 3 and 4). As a rule, the cyst, unless it has been inflamed, will separate quite easily except at its posterior attachment. If the cyst is punctured its removal will be more difficult.

Bleeding points, especially the branches of the internal pudic vessels at the back of the cyst, must be ligatured with catgut, using mattress sutures if necessary. The cavity from which the cyst has been removed is next obliterated with a series of



FIG. 4.—Cyst of Bartholin. Cyst practically enucleated.

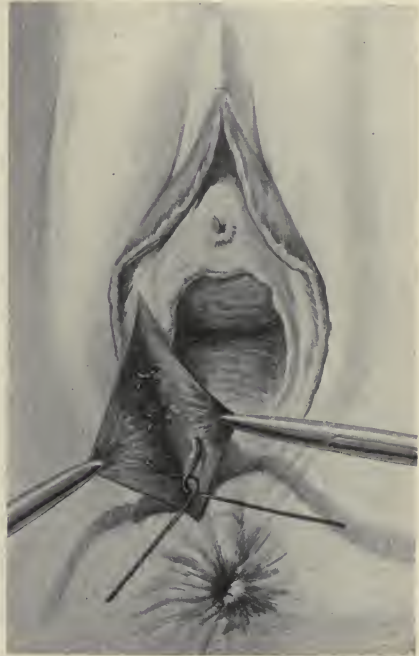


FIG. 5.—Cyst of Bartholin. Obliteration of cyst-cavity with interrupted catgut sutures.

interrupted catgut sutures (Fig. 5), and lastly, the mucous membrane and skin incision is united with a continuous catgut suture (Fig. 6).

Hydrocele of the Canal of Nuck.—*Cause.*—This condition has a developmental origin, and is due to a collection of fluid between the round ligament and its sheath of peritoneum. The fluid may, or may not, be shut off from the peritoneal cavity; if it is excluded the hydrocele is said to be encysted. It is a rare condition.

Symptoms.—Unless it becomes inflamed a hydrocele of the canal of Nuck will not occasion any symptoms.

Signs.—An encysted hydrocele presents as a small, elongated, slightly movable cystic swelling in the upper part of the labium majus. It is dull on percussion, cannot be reduced, and is translucent. A band can be felt stretching between its upper pole and the external inguinal ring. If the hydrocele is not encysted, the swelling only appears when the patient stands up, and will be found stretching from

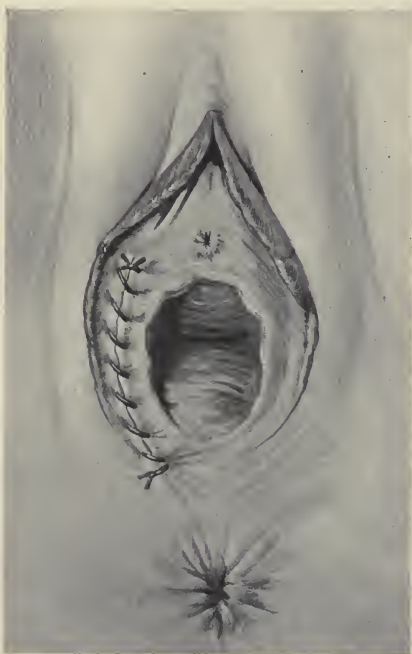


FIG. 6.—Cyst of Bartholin. Suture of the primary incision.

the external inguinal ring into the upper part of the labium. It can be easily reduced without a gurgle. If the encysted hydrocele becomes inflamed it will be very tender. If the dilated sheath of peritoneum of an encysted hydrocele has more than one constriction the hydrocele will be divided into loculi and two or more swellings will be felt.

Diagnosis.—An inflamed encysted hydrocele may simulate a strangulated inguinal hernia. The absence of vomiting and the other indications of a strangulated hernia will disclose the nature of the swelling.

Treatment.—The skin and subcutaneous tissues are carefully incised in the long axis of the swelling. The sac having been exposed is opened and then dissected out. If the sac communicates with the peritoneal cavity its neck should be first ligatured with catgut suture.

Sebaceous Cysts.—*Symptoms.*—Unless they become inflamed or are large, sebaceous cysts do not give rise to any symptoms.

Signs.—These cysts occur on the labia majora or mons veneris, and rarely on the labia minora. They are generally small, but may be as large as a walnut.

Treatment.—The cyst should be excised. If it has suppurated the pus should be evacuated and the interior of the cyst swabbed with pure carbolic acid and drained with a piece of gauze. Hot antiseptic fomentations should then be applied and the packing changed daily.

Papillomatous Cysts of the Labium Majus.—Papillomatous cysts are very rare

and occur on the labia majora. Their source is unknown. They are seldom larger than a pea.

Treatment.—They should be excised.

Cysts of the Hymen.—*Cause.*—Cysts of the hymen are very rare. They are usually considered to be due to the in-pushing and separation of portions of the epithelium of the hymen. By some they are attributed to dilated lymph-spaces or remnants of Gartner's duct. They may be congenital or may appear in adult life.

Symptoms.—Other than dyspareunia or retention of urine, cysts of the hymen do not give rise to any symptoms.

Signs.—These cysts range in size from a hazel nut downwards, and are easily identified as translucent swellings attached to the hymen.

Treatment.—The cyst should be excised.

Dermoid Cyst of the Clitoris.—A dermoid cyst of the clitoris has been described. The patient noticed a swelling on the vulva which, after three months, became painful and then burst spontaneously. The pain disappeared and contents were discharged. The tumour gradually enlarged to the size of a hen's egg and again became painful. At the end of a year it was excised and proved to be a dermoid cyst of the clitoris which had undergone carcinomatous degeneration.

Cyst of the Labium Minus.—Cysts of the labium minus due to Wolffian relics have been described as large as a Tangerine orange. They may be single or multiple. Small sebaceous cysts of the labium minus may also be found.

Treatment.—Sebaceous cysts should be *incised* and the others should be *excised*.

Haematoma Vulvae.—A haematoma of the vulva will form at first a cystic swelling. For the diagnosis of such a swelling the reader is referred to the description of this condition.

SOLID SWELLINGS

Fibroma of the Vulva.—A fibroma of the vulva is rare and is usually found on the labium majus (Fig. 7).

Symptoms.—Unless it ulcerates, when the patient will complain of pain, discharge, and bleeding, the symptoms due to fibroma of the vulva are purely mechanical.

Signs.—These tumours are generally small, pedunculated, and hard, and they are not tender unless inflamed. Mucoid degeneration may take place in them, in which case they become soft and have been mistaken for vaginal cysts.

Treatment.—The pedicle should be divided and the vessels supplying the tumour ligatured if necessary.

Fibroma of the Round Ligament in the Inguinal Canal.—These tumours form

hard, slightly movable, painless swellings in the inguinal region and are not reducible. They do not cause any symptoms, and are differentiated from other swellings in this neighbourhood, such as a hydrocele or hernia, by their consistence and irreducibility. They are extremely rare.

Adenomyoma of the Round Ligament.—This is a very rare tumour. Kelly¹



FIG. 7.—Fibroma of the vulva.

describes a tumour of this character, which he removed, as differing in no way in its clinical features from a fibroma of the round ligament. It is benign.

Lipoma.—Fatty tumours may be very rarely found in the labia majora or mons veneris (Fig. 8).

Symptoms.—Such tumours, as a rule, being small, do not cause any inconvenience unless ulcerated. Occasionally fatty tumours in this situation attain a very large size, and may be a cause of dyspareunia or difficulty in walking, and have been known to obstruct child-birth.

Signs.—Lipomata may be pedunculated or sessile; they are movable. Their consistence varies somewhat, but they are softer than fibromata, and the skin over them is not freely movable. At times they are so soft that they have been mistaken for cysts. A sessile lipoma may extend into the inguinal canal and simulate a hernia, but there is no im-

pulse on coughing and the swelling is not reducible.

Treatment.—If causing trouble these tumours should be excised.

Papilloma.—*Cause.*—The single warts are either simple or malignant in nature. The multiple warts are due to uncleanliness and gonorrhoea, being most frequently found in dirty women of the lower classes.

Symptoms.—The simple wart does not give rise to any symptoms. The malignant wart is often associated with leukoplakic vulvitis, and the patient will complain of

¹ *Operative Gynaecology.*

irritation, pain, and discharge. Multiple warts give rise to irritation and a very offensive discharge.

Signs.—The single wart is pigmented, and has the characters of a wart in other parts of the body. The malignant wart will often be found associated with the third stage of leukoplakic vulvitis. It bleeds easily on being touched.

Multiple warts vary in size from that of a millet seed to that of a small coco-nut.



FIG. 8.—Lipoma of the vulva.



FIG. 9.—Papilloma of the vulva.

They are sessile or pedunculated (Fig. 9). The exposed surfaces of the warts are dry, the protected surfaces are moist with a very offensive discharge. They may increase in size rapidly during pregnancy.

Treatment.—A single wart of the vulva has occasionally been the seat of a melanotic sarcoma. It is safer, therefore, to excise it, and certainly this should be done if it grows. A malignant wart should also be excised with a wide margin of tissue round it, together with the inguinal glands. Multiple warts, if very small, can be treated by strict cleanliness and dusting with calomel. If, however, the warts are of any size it is better to snip them off with scissors, afterwards cauterizing their base.

Carcinoma.—Carcinoma of the vulva is in nearly all cases of the squamous-celled variety. It may be primary or secondary to carcinoma of the vagina. Very rarely columnar-celled carcinoma may be found affecting Bartholin's gland, and chorion-epithelioma has been noted in the vulva several times.

Squamous-celled Carcinoma.—This disease appears in the majority of women after the menopause, but has been noted as early as thirty years of age. It is always preceded by the condition known as leukoplakic vulvitis.



FIG. 10.—Squamous-celled carcinoma of the vulva.

deep intractable fissure. The nodule eventually ulcerates, but before doing so may attain the size of a walnut (Fig. 10). The ulceration gradually involves the whole of the labia, and may even spread to the abdomen and thighs; it secretes a very offensive discharge, but does not bleed to any extent unless some large vessel is involved.

The inguinal glands on one or both sides are early affected, and are at first hard and resemble an inflammatory enlargement. The skin over them in time becomes red and they eventually soften and ulcerate.

Diagnosis.—Carcinoma of the vulva has to be distinguished in its early stages

Symptoms.—The patient will give a history of pruritus vulvae due to the antecedent vulvitis. The patient does not usually seek advice in the early stages of the disease, either because symptoms are absent or because the slight irritation present is neglected. Later, the patient complains of pain, of a "sore place" on the vulva, and of a slight discharge, perhaps tinged with blood. In the terminal stages the growth gives rise to the greatest distress from the discharge, pain, and haemorrhage, and involvement of the urethra, bladder, and rectum.

Signs.—The disease most commonly starts on the inner surface of the labium majus and then on the labium minus or prepuce of the clitoris, either as a small hard nodule, or as a small excavated ulcer with indurated and everted edges, or as a

from syphilitic ulceration. If there is any doubt the blood of the patient should be examined for the Wassermann reaction, and the discharge from the growth microscoped for the presence of the *spirochaeta pallida*. It is most important to remember that the ulcers found in the third stage of leukoplakic vulvitis are malignant, or if not, will become so if not removed. Tuberculous ulceration and rodent ulcer can



FIG. 11.—Excision of carcinoma of the vulva. Incision through the skin and subcutaneous tissues well clear of the disease and of any patches of leukoplakic vulvitis that may be present.



FIG. 12.—Excision of carcinoma of the vulva. Incision of vaginal mucous membrane at the vaginal orifice. The incision is carried above the urethra.

be diagnosed by the microscopical examination of a portion of the growth. A malignant enlargement of the inguinal glands is easily diagnosed from inflammation of these structures, pain therein being absent.

Pathology.—The pathology of carcinoma of the vulva and the relation of this disease to leukoplakic vulvitis is fully described on p. 7.

Multiple Carcinomata of the Vulva.—Multiple carcinomata are more frequently met with in the vulva than in any of the other common sites of this

disease, and this occurrence has been interpreted by some as an evidence of auto-inoculation.

If the parts are carefully examined in such cases it will be noted that many growths which appear to be double are in reality bridle-shaped, a thin track of carcinomatous tissue uniting them across the middle line; these may be termed 'pseudo-multiple' growths. True multiple growths are sometimes present, each



FIG. 13.—Excision of carcinoma of the vulva.
Removal of the diseased tissue bounded by the two incisions.

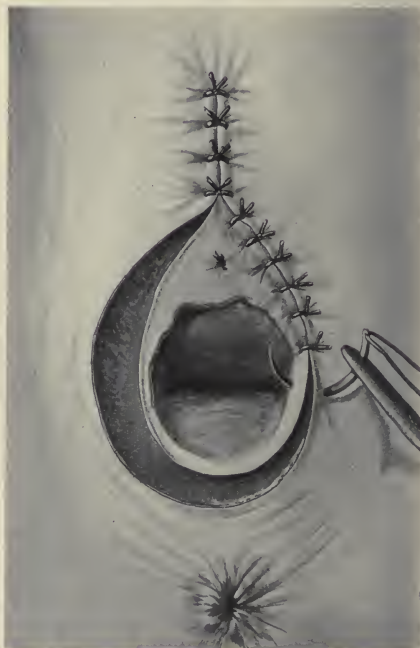


FIG. 14.—Excision of carcinoma of the vulva.
Uniting the cut edges.

separated by a tract of mucosa showing the typical changes associated with leucoplakic vulvitis, and microscopically each separate growth can be demonstrated to be an entity to itself, starting in its own set of hypertrophic interpapillar processes.

Treatment of Carcinoma of the Vulva.—Whenever the growth is 'operable' it should be removed by an operation planned in the following manner.

The patient being in the lithotomy position, an oval incision, commencing

above the clitoris and ending in front of the anus, is made through the skin and subcutaneous tissues well clear of the disease, and of any portion of the vulva affected with leucoplakic vulvitis (Fig. 11).

An incision is next made round the vaginal orifice and over the top of the urethra (Fig. 12). The tissues limited by these two incisions are then freely removed (Fig. 13), all bleeding vessels being secured, for the time being, with pressure-forceps.

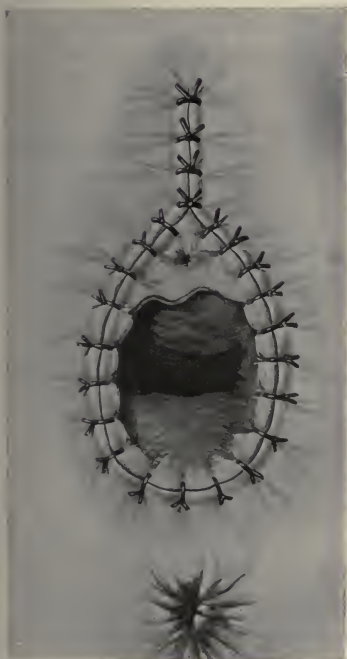


FIG. 15.—Excision of carcinoma of the vulva. The cut edges united.



FIG. 16.—Excision of carcinoma of the vulva. Dotted line shows the direction of the incision, to remove the inguinal glands.

After the growth has been removed the cut vessels are ligatured and the wound then closed as follows. Above the urethra the edges of the skin incision are approximated by sutures passed deep to the cut surface, and below the urethra the cut edge of the skin is sutured to the cut edge of the vagina in a similar way (Figs. 14 and 15). Catgut sutures may be used all through, but if the vulval growth is a large one, and there is much tension when the catgut sutures are tied, they can be reinforced with

silk-worm gut sutures passed at suitable intervals. The procedure above described is that for removing the whole of the vulva. If it is necessary to remove only a portion of the vulva, the method is approximately the same.

The inguinal glands are best removed at the time by an incision parallel to Poupart's ligament, and, if possible, they should be removed in one piece, together with the subcutaneous tissue in which they are lying. The line of incision for removal of these glands is indicated in Fig. 16.

Columnar-celled Carcinoma.—Adenocarcinoma of Bartholin's gland is a very rare disease. It has occurred between the ages of twenty-eight and ninety, half of the women being over fifty years of age.

Symptoms.—The patient complains of a severe pain, especially on walking, extending at times to the coccyx and groin. Dyspareunia is present, and the pain is increased by menstruation.

Signs.—The disease commences as a tender, hard, nodular swelling on the lower part of the labium majus. The skin covering the swelling may be bluish in colour and the remains of the hymen may be oedematous. The growth eventually perforates the skin and forms a large fungating mass involving the pubic bone. The inguinal glands are early affected.

Treatment.—The growth should if possible be treated by free excision, and the inguinal glands should be removed, a piece of the pubic arch being also removed if the growth is in contact with the bone.

Herbert Spencer¹ has collected the after-histories of 14 cases, and only one other besides his own had remained free from recurrence over a year.

Sarcoma.—Primary sarcoma of the vulva is a very rare disease, and occurs most frequently between the ages of thirty and fifty.

Symptoms.—The symptoms of discharge, bleeding, dysuria, and pain only supervene with the ulceration, and therefore in the early stages the patient will not complain unless she happens to notice a lump in the vulva. In the late stages the patient may have incontinence of urine.

Signs.—According to Blair Bell² the most common site of origin appears to be the labia majora. In general it presents the appearance of carcinoma of the vulva already described.

Pathology.—The nature of the growth may be round-celled, spindle-celled, or myxomatous and mixed-celled, the latter being the most common variety.

Diagnosis.—Sarcoma of the vulva is distinguished from carcinoma of this

¹ *Proc. Roy. Soc. Med. (Obst. and Gyn. Sect.)*, 1914, vol. vii. p. 102.

² *Journ. of Obstet. and Gyn. of the Brit. Emp.* vol. xii. p. 275.

region by the microscopical findings. It occurs on the average at an earlier age than carcinoma. The prognosis is worse.

Treatment.—The only chance of curing the disease is to detect it early and completely remove it by the method described for carcinoma of the vulva.

Malignant Melanoma.—Malignant melanoma is the term used by Eardley Holland¹ to denote all malignant melanotic tumours of the vulva whether they be sarcomata or carcinomata. The majority of them are sarcomata.

These tumours, which are commoner than pure sarcoma, occur in the majority of cases in patients over fifty years of age.

Symptoms.—Until ulceration, which occurs early, appears, the patient complains, if at all, of the lump in the vulva associated with a little pruritus. Discharge, bleeding, and pain result from the ulceration, which, in the later stages, may extend into the bladder and rectum.

Signs.—Malignant melanoma most commonly appears on the labium majus, probably because this part of the vulva is more pigmented than the rest. The majority of the tumours are situated on the anterior part of the vulva, whether on the labium majus or minus (Fig. 17). Before the tumour ulcerates it presents as a purple or black growth on the skin not larger than a hen's egg. The inguinal glands are as a rule involved early in the course of the disease.

Pathology.—The origin of these tumours is uncertain. Many authorities contend that the growth arises in the epithelium, whilst others maintain that its origin is the connective tissue. Holland, after a full consideration of the views advanced by various investigators, is of the opinion that in the majority of cases the growth is sarcomatous in nature, and that only rarely does it arise in pigmented moles.

Prognosis.—The prognosis is very bad, early recurrence being the rule.



FIG. 17.—Malignant melanoma of the vulva, arising from the region of the clitoris.

¹ *Journ. of Obstet. and Gyn. of the Brit. Emp.* vol. xiv. p. 309.

Treatment.—An early and wide excision of the growth, including the inguinal glands, is necessary in order to give the patient the least chance of cure.

Secondary Sarcoma.—This condition will be diagnosed by the presence of sarcoma in the uterus or vagina, and if necessary, by the microscopical appearances of the growth.

Tuberculosis.—This rare condition is described in the Article on Tuberculosis (Vol. I. p. 589).

Myxoma.—A pure myxomatous tumour of the vulva is very rare. Simpson¹ describes a case as occurring in a Jewess aged 16.

Symptoms.—The patient noticed a growth on the vulva accompanied by bleeding. She had first noticed it when 13 years of age. As the swelling increased in size it became pedunculated and hanging down interfered with walking. Later, ulceration occurring, the health of the patient began to suffer from the resulting haemorrhage.

Signs.—The tumour had a lobulated appearance, the masses varying in size from 2 cm. to $\frac{1}{16}$ cm. in diameter. The growth was firm and elastic and the skin covering it was ulcerated in certain areas.

Pathology.—On section the growth was mostly composed of clear gelatinous material, through which stretched strands of well-formed fibrous tissue.

Histologically the gelatinous substance was myxomatous tissue.

Prognosis.—The prognosis of myxoma of the vulva if removed is very good. It will not return.

Treatment.—The growth should be excised.

Haematoma Vulvae.—*Cause.*—A haematoma of the vulva may be caused by direct injury from a kick or blow, it may result from operations on the vulva, or it may be due to the rupture of a varicose vein in this situation, from a fit of violent coughing or some great exertion. Fatal cases due to the amount of haemorrhage have been recorded.

Symptoms.—The patient complains of a very tender painful swelling in one or other labium, and the amount of blood lost may be sufficient to make her anaemic.

Signs.—The blood may escape above or below the pelvic fascia; the latter is the more common.

An *infrafascial haematoma* distends the labium majus, and the blood may infiltrate the perineum and pararectal connective tissue and spread to the abdominal wall. The swelling will be cystic, doughy, or hard, according to the period that has elapsed since the injury. The size of the swelling varies with the amount of blood effused, it has no particular shape and the skin over it is discoloured. As a rule the

¹ *Journ. Obstet. and Gyn. Brit. Emp.* vol. viii. p. 393.

tension of the extravasated blood after a while stops further haemorrhage, but the skin may burst and external haemorrhage will result. If the blood becomes infected a labial abscess will result.

A *suprafascial haematoma* is retroperitoneal and the blood infiltrates the connective tissue of the pelvis. On examination a swelling is found in the vagina, the lumen of which may be practically occluded. The rectum will be compressed.



FIG. 18.—Varicose veins of the vulva.



FIG. 19.—Excision of varicose veins of the vulva.
Incising tissue over the veins.

It is difficult to diagnose. There is a third form of haematoma, in which the bleeding is originally suprafascial, and the blood perforates the fascia and infiltrates the labium. A vulval haematoma may cause obstruction to child-birth.

Diagnosis.—The swelling has to be distinguished from a strangulated inguinal hernia and an inflamed Bartholin's gland, both of which produce painful swellings in the vulva (see p. 11). In the case of a haematoma, however, the skin, as already observed, is discoloured, and unless it suppurates there is no sign of inflammation.

Treatment.—Cold lead lotion should be applied to the swelling. If the blood becomes infected the pus must be evacuated by a free incision, the cavity packed

with gauze, and hot antiseptic fomentations applied. For the treatment of haematoma during child-birth the reader is referred to a text-book of obstetrics.

Varicose Veins.—*Cause.*—The most marked examples of varicose veins of the vulva can be seen complicating pregnancy. Any tumour pressing on the pelvic veins may give rise to this condition, as may also obstruction to the venous circulation from other causes.



FIG. 20.—Excision of varicose veins of the vulva. Freeing of the veins; ligature and excision at the upper part.



FIG. 21.—Excision of varicose veins of the vulva. Closure of skin incision.

Symptoms.—The patient complains of vulval discomfort and swelling.

Signs.—The dilated vulval veins can easily be seen, they may be situated in one or both labia (Fig. 18). In severe cases, more especially those associated with pregnancy, the vessels become almost as large as the little finger, and extend over the mons veneris on to the lower part of the abdomen.

Treatment.—If the condition is noted first during pregnancy, the question of inducing labour will have to be carefully considered, since the veins may burst from the increased pressure in them during labour and form an obstruction to the birth

of the child or placenta. If rupture takes place externally very alarming and perhaps fatal haemorrhage may result. Apart from pregnancy the veins can be removed as follows:

The affected labium having been stretched in its long axis, by the operator with his finger and thumb, an incision is made over and down to the veins (Fig. 19). The skin edges of the incision are retracted with forceps and the veins freed (Fig. 20). A ligature of catgut is now passed round the upper and lower limits of the bunch of veins as far apart as possible, tied, and the veins between the ligatures excised. All bleeding points having been secured, the skin-incision is closed with a catgut suture (Fig. 21).

Oedema of the Vulva.—*Cause.*—Oedema of the vulva is associated with vulvitis, with varicose veins of the vulva, and with renal and cardiac disease. The most marked examples of this condition can be seen in pregnancy complicated with albuminuria.

Symptoms.—The patient complains of pain and discomfort and swelling of the vulva.

Signs.—The usual signs of oedema are present. The inner surfaces of the labia majora may be sloughing from pressure against each other.

Treatment.—The patient should be kept at rest and the foot of the bed should be tilted. The cause of the oedema must be treated if possible, and if it is very marked the labia should be punctured in several places with a scalpel and hot fomentations applied.

Elephantiasis of the Vulva.—*Cause.*—This disease is due to an obstruction of the lymphatics of the vulva by the *filaria sanguinis hominis*. True elephantiasis is sometimes found even when the filaria are absent from the blood.

Symptoms.—The symptoms are due to the size of the tumour and its ulceration if this occurs. The patient may be unable to walk or sit, and may suffer from retention of urine.

Signs.—These tumours may be single or there may be more than one. They are generally situated on the labia majora, but may spring from the labia minora. Their surface is smooth or irregularly nodulated and they are covered with normal skin, unless it has become ulcerated by pressure. The secretion of the skin collects on the tumour and decomposing becomes very offensive. When large—and they may weigh seventy-five pounds or more—these tumours displace the vaginal orifice and adjacent structures, and may spread to the thighs and buttocks.

Treatment.—The tumours should be removed by an incision round their base.

Endothelioma of the Vulva.—An endothelioma of the labium majus has been

described as a semi-solid swelling, tense and painless. Its nature could not be identified before removal.

Teratoma of the Vulva.—Duclaux and Herrenschmidt removed a tumour from the labium majus which was as large as the egg of a goose, soft, semi-fluctuating, and smooth. On the free edge of the labium was an opening leading into a diverticulum, an inch long, which exuded a muco-purulent fluid. The tumour consisted mostly of fat, and the lining of the diverticulum was reddish-blue in colour and thrown into circular folds. Microscopically the mucosa lining the diverticulum corresponded to that of the large intestine. The anus was normal, the vagina and uterus double.

The condition was due to the foetal inclusion of a portion of the lower gut. The patient complained of discomfort due to friction.¹

Esthiomène.—*Cause.*—The exact nature of this condition has long been in doubt. By some it is considered to be due to a chronic infection, by others to tubercle, and by others to syphilis.

The following account is based on an exhaustive historical, pathological, and clinical study of the disease by Lena Kurz,² who comes to the conclusion that esthiomène is a manifestation of tertiary syphilis, and that the syphilitic virus is the sole cause of the disease for the following reasons :

- (a) A direct or probable history of syphilis is almost always obtained.
- (b) The majority of early cases of esthiomène respond to anti-syphilitic treatment. The late and chronic cases which do not respond do not indicate that esthiomène may at times be due to other causes than syphilis; there are many tertiary lesions, such as strictures and others, which do not yield to the usual antisymphilitic remedies and which are none the less due to syphilis.
- (c) The chronic course of esthiomène, marked by attempts at healing with subsequent relapses, the absence of local disturbances, and the non-impairment of the general state of health, indicate the syphilitic nature of the condition.
- (d) The masses of cicatricial tissue with subsequent contraction, producing severe strictures and extensive deformities, are typical of no other disease. Where the necrosing process is in excess over the tendency to fibrosis, there is the enormous tissue-destruction characteristic of syphilis.
- (e) In no other constitutional disease is there such a constantly present combination of hypertrophy and ulceration as in syphilis. In elephantiasic hypertrophies there may be a small amount of ulceration. Often none is present. In tuberculosis

¹ *Bull. et Mém. de la Soc. Anat. de Paris*, May 1905.

² *Journ. Obstet. and Gynec. Brit. Emp.* vol. xxiii. p. 353.

of the vulva the ulceration is usually extensive and the hypertrophy of parts is slightly marked or absent.

(f) The microscope reveals the typical gumma or granuloma of the third stage.

Up to the present time we find no cases recorded where the *spirochaeta pallida* was found in tissues affected with esthiomène. It is a well-known fact that the organism does exist though in comparatively small numbers in the lesions of the tertiary stage, but it is usually difficult to find. With easier methods of demonstrating the organism the time may come when the spirochaete of Schaudinn will be found in esthiomène-tissues with the same ease as the bacillus of Koch in tuberculous lesions.

Esthiomène is rare under twenty years of age and is most frequently found between twenty and forty. It occurs more commonly in the unmarried than in the married. Miscarriages, premature births, and small families are commonly met with in patients suffering from this disease. As accessories, prostitution, uncleanness, and a life of misery and neglect are important factors, the disease being very rare in the absence of such conditions.

Symptoms.—In the earlier stages of the disease the patient does not usually complain unless it be of a lump in some part of the vulva. As ulceration progresses there will be a certain amount of discharge, and some pain may be present, while, if the ulceration extends to the bladder and rectum, incontinence of urine and faeces will result. It is a feature of this disease that the condition may become advanced before any complaint is made, and for this reason esthiomène is only rarely seen in its early stages.

Signs.—Esthiomène is a disease always associated with ulceration and hypertrophy, but not to the same degree. Thus, if the hypertrophy is marked the ulceration is not extensive, and *vice versa*.

In the *first stage* small inflammatory patches appear on the mucous membrane, together with small fleshy nodules. The patches in time become ulcerated, and these form the commencement of the *second stage* of the disease, in which the ulceration and hypertrophy become more marked. The clitoris and labia minora are most frequently affected, although the whole vulva may be involved.

The hypertrophied masses are generally sessile, and in time form large, firm, uneven protuberances which are not tender. The skin covering them is usually dry and hard, and greenish-yellow or white in colour. In the recesses of the nodular masses irregular ulceration occurs. There is no definite type of ulcer found, and the ulceration may be shallow or deep.

The *third stage* appears if the ulcerative process is much in excess over the

hypertrophied one. The ulceration is deep, fistulae being formed involving the bladder and rectum, and the urethra. The cicatrices produced are firm, unyielding, and large, and their contracture leads to marked deformity.

Pathology.—The condition is one of constant fibrous-tissue formation, showing an ever-spreading margin of new granulation tissue, a heaping up of old fibrous tissue with a tendency to necrosis in one part, and cicatrization in another.

The hypertrophied masses of esthiomène are gummatus, and consequently undergo the same tendency as gummata elsewhere to necrose, leaving indolent chronic slow-spreading ulceration. The cell-elements are the same as those of gummata, the inflammatory cells are mostly plasma-cells and lymphocytes. Numerous capillaries are present; the fibrous coats of the blood-vessels are immensely thickened even at an early stage. Later the intima of the vessels is also thickened. At any period of its existence the gumma may break down. This breaking down may occur early, when the tissues surrounding the necrosed area are still infiltrated with plasma-cells and the granulation tissue is new and vascular. Or it may occur later when the well-formed connective tissue has already settled down into strands of wavy fibrillated bundles. At an early stage the necrotic cells look uniformly granular and gelatinous. A zone of small, darkly-staining cells surrounds the necrosing area. Beyond it there is a ring of never-failing fibrous tissue, from which cicatrizing processes will spread inwards when necrosis is completed and the breaking-down tissues discharged.

There are numerous areas where fat-deposits, degenerating cells, and spaces of uniform appearance without cell-elements, mark the areas of impending necrosis. They are surrounded by rings of small round lymph-cells and plasma-cells. At the edges of the hypertrophied masses the presence of fibrosis in every stage of formation can be seen.

Granulomatous infiltration with widespread ulceration appears to occur in the ill-nourished wasting people with no powers of resistance. It appears to have some analogy to phagedaenic ulceration, which undoubtedly occurs in those whose tissues, from some cause or other, show no attempt to combat the syphilitic virus.

Diagnosis.—Esthiomène was also termed *lupus vulvae* on the assumption that the condition was tuberculous, as evidenced by the eroding, ulcerating, inflammatory, and hypertrophic nature of the disease, but the microscopical findings show that the lesion is not a tuberculous one.

Some forms of elephantiasis of the vulva associated with pressure-ulceration have been confused with esthiomène, but their histology is quite different.

Prognosis.—Cases which show response to treatment within the first two years

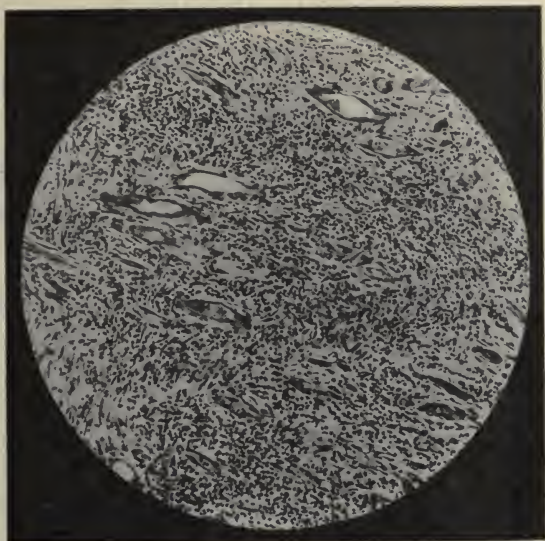


FIG. 22.—Esthiomène. High power. Section from edge of hypertrophied mass, showing inflammatory tissue of fairly recent date. (After Lena Kurz.)

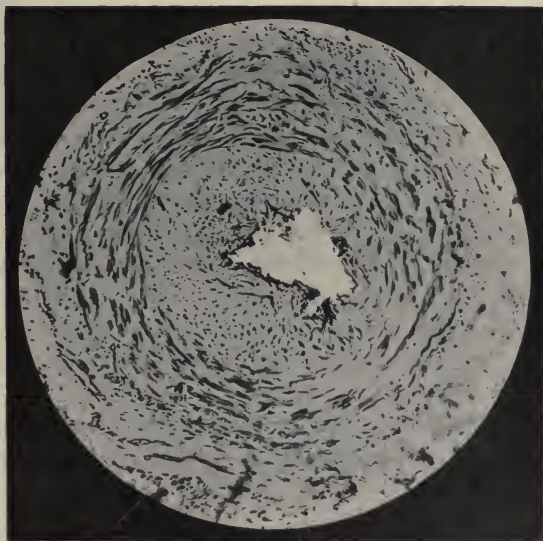


FIG. 23.—Esthiomène. High power. Blood-vessels showing marked sclerosis and endarteritis. (After Lena Kurz.)

of the history present a favourable prognosis. Very often those ulcerations which are comparatively acute and rapidly spreading respond more definitely than slow callous ones. Occasionally it happens that recovery appears to have been complete, but some small area of ulceration has persisted, and when treatment is stopped esthiomène recurs. Where the condition has existed for some years, and response to treatment has been *nil* or slight and temporary with speedy relapses, the prognosis is very grave. The longer it persists the greater is the risk of excavations and fistulae appearing; these invariably end in death from exhaustion. Intermittent attacks of pelvic peritonitis, with vomiting, diarrhoea, and a febrile temperature, are typical of the last stages of esthiomène.

Treatment.—Mercury and iodide of potassium should be prescribed, and the patient should be treated with salvarsan.

The affected parts must be kept scrupulously clean, ulceration should be treated with *lotio nigra*, and the surrounding parts should be dusted with a powder of oxide of zinc and calomel. If these measures are not successful, the hypertrophied masses should be removed, and superficial ulcers should be scraped.

CONGENITAL AND ACQUIRED DEFECTS OF THE VULVA

Malformations of the vulva may be congenital or acquired.

Congenital Defects.—For congenital defects of the vulva, such as adhesion of the labia, hypertrophy of the labia or clitoris, double vagina, imperforate hymen, etc., the reader is referred to the sections dealing with these conditions (see Vol. I. p. 272).

Acquired Defects.—**Atrophy.**—*Cause.*—As a result of the normal menopause, or of that induced by operation, the vulva atrophies, as it also does with the disease known as kraurosis vulvae.

Symptoms.—The patient may complain of dyspareunia.

Signs.—The atrophy affects mostly the labia majora, so that the labia minora become unduly prominent. The vaginal orifice is contracted.

Adhesion of the Labia.—*Cause.*—As a result of inflammation the labia may become adherent. Such a defect most often occurs in childhood, as the result of one of the acute infective diseases.

Symptoms.—If the adhesion is complete the patient will complain of the symptoms of retained menses (see Vol. I. p. 318). If the adhesion is incomplete there will not be any symptoms till marriage, when dyspareunia will occur.

Signs.—The labia majora are found more or less united.

Treatment.—The labia must be separated by a plastic operation.

INJURIES OF THE VULVA

The vulva may be injured by accident, assault, during coitus, or as the result of child-birth.

Injuries from Accident or Assault.—A hæmatoma or lacerated wound of the vulva may result from accident or assault. The bleeding from a laceration of the vulva may be very severe. For further information respecting a hæmatoma of the vulva, see p. 26.

The hymen may be lacerated during a digital examination, or if a speculum is inserted into the vagina.

Lacerated wounds of the vulva require similar treatment to lacerated wounds in other parts of the body.

Injuries due to Coitus.—The hymen is generally lacerated at the first coitus. The extent of the laceration varies from a small tear to one involving the vaginal wall. In cases of rape on young children or on virgins the injury may be very extensive, including laceration or bruising of the labia and separation of the hymen from its entire attachment.

The patient will complain of pain, and there is generally a little bleeding. Occasionally, the hæmorrhage is so severe that the bleeding parts have to be sutured under an anaesthetic.

PRURITUS VULVAE

Cases of itching and irritation of the vulva may be divided into two classes :

1. Those in which an apparent cause cannot be discovered.
2. Those in which a definite cause is ascertainable.

Cases in which an Apparent Cause cannot be discovered.—If an apparent cause cannot be found for the pruritus, the condition must be attributed to an affection of the vulval nerves—a neurosis.

Symptoms.—The patient will complain of irritation which varies in intensity from a slight itching at one particular spot, to an intense itching involving the whole of the vulva. The pruritus may be so severe that the patient is unable to mix with her fellow-creatures owing to the constant scratching of the vulva which she finds necessary; more than one case has been reported in which the mind became unhinged, and the patient committed suicide. The pruritus is worse at night and when the patient gets hot.

Signs.—In the early stages of pruritus the vulva will appear normal. In most cases, however, advice is not sought till the condition has been present for some long

time. In these cases, owing to the constant rubbing and scratching, the vulva is in an eczematous condition. Any part or the whole of the vulva may be affected. As a rule, the labia minora or clitoris are first attacked, but as the condition gets worse the pruritus extends to the labia majora, perineum, adjacent surfaces of the thighs, and over the mons veneris on to the lower abdomen.

Cases in which a Definite Cause is ascertainable.—Pruritus vulvae may be due to irritating discharges from the genital tract, skin disease, congestion of the vulva, or parasites.

Irritating Discharges.—A leucorrhoeal discharge from any cause may give rise to pruritus vulvae, as also may the continued irritation of diabetic urine or urine escaping from a vesico-vaginal or uretero-vaginal fistula.

Skin Diseases.—Leukoplakic vulvitis, eczema, and herpes of the vulva cause pruritus.

Parasites.—The pruritus may be due to scabies, pediculi, or thread-worms.

Congestion.—The premenstrual congestion and the congestion due to a pelvic tumour or to pregnancy at times gives rise to marked pruritus. In the case of pregnancy the irritation is thought to be toxic in nature.

Symptoms.—The symptoms are similar to those already described in the nerve cases, but as a rule are not so marked.

Signs.—The signs will depend partly on the cause and partly on the local condition resulting from the constant rubbing and scratching. The urine should always be examined for the presence of sugar in cases of pruritus.

Prognosis.—If a cause for the pruritus cannot be found the disease is very often most intractable, and many remedies may have to be tried before relief is obtained.

Treatment of Cases in which an Apparent Cause cannot be discovered.—The patient must be put on a non-stimulating diet. Alcohol in any form should be forbidden, as also should such condiments as mustard, pepper, and sauces. Meat should be taken sparingly, and made-up dishes with rich sauces must be avoided. The patient must be told that scratching only tends to make matters worse, and therefore is to be avoided as far as possible. The irritation is generally increased at night, and relief may be sometimes obtained with a hot hip bath before going to bed.

A mixture containing bromides at times relieves the irritation, and chloride of calcium, gr. 20 to 40, in an ounce of water three times a day, has also proved useful. Reliance, however, has to be placed chiefly on local treatment, and this often is unsatisfactory. One or more of the following remedies may have to be tried before relief is obtained :

- | | | |
|--|--|---|
| R Chloroformi, ʒi.
Olei Amygdalae, ʒi. | R Menthol, 5 per cent.
Olei Amygdalae, 95 per cent. | R Ung. Cocain, 5 per cent. |
| R Ung. Resinol. | | |
| R Lot. Acidi Carbolici, 1 in 40. | | R Liq. Ammonii Acetatis, ʒiiss. |
| R Lot. Hydrarg. Biniod., 1 in 2000. | | Acidi Hydrocyan. dil., ʒiiss. |
| | | Infus. Tabaci, ad ʒviii. |
| R Lot. Plumbi, c. Opio. | | R Liq. Picis Carbonis, ʒi. |
| | | Ung. Acidi Borici, ʒi. |
| R Zymocide, 1 part.
Aquae, 5 parts. | | |
| R Bismuthi Oxidi, ʒi.
Acidi Oleici, ʒi.
Cerae Albae, ʒiii.
Paraffini Mollis, ʒix. | | R Ichthyol, ʒii.
Olei Amygdalae, ʒiv.
Liq. Calcis, ʒiv.
Glycerini, ʒi.
Aquae Rosae, ʒi. |

If these remedies fail the parts may be painted with pure carbolie acid, the patient being under an anaesthetic. X-rays are at times successful. Lastly, if the area of irritation is limited, a cure may be effected by excising the part, but the advisability of such a procedure, if the pruritus affects all the vulva, is of course a matter for serious consideration.

Cases in which a Definite Cause is ascertainable.—The cause having been discovered the appropriate remedies must be prescribed. In this connection particular mention must be made of leukoplakic vulvitis. In the early stages some of the remedies already mentioned may be of service, and the writer has seen marked relief follow the application of X-rays. On the other hand, in some cases, the pruritus gets worse with such treatment. If, however, the condition is at all advanced, the best treatment is to excise the parts, and this is all the more indicated since leukoplakic vulvitis is a precancerous condition.

VAGINISMUS

The term vaginismus denotes a spasm of the anterior fibres of the levator ani, with the result that the vaginal orifice is contracted, and because of this and the pain it induces, coitus or digital examination is rendered very difficult or impossible.

Such cases may be divided into two classes :

1. Those in which an apparent cause cannot be discovered.
2. Those in which a definite cause is ascertainable.

Cases in which an Apparent Cause cannot be discovered.—This variety of vaginismus is a neurosis, and is associated with extreme hyperaesthesia of the vulval mucous membrane.

Symptoms.—Unless it has been found necessary to make a vaginal examination before marriage the vaginismus will not be discovered till then, when the patient will complain of dyspareunia or of sterility, leaving the medical attendant to discover the fact that the sterility may be due to the dyspareunia.

Signs.—Vaginal examination is rendered difficult or impossible, owing to the contraction of the vaginal orifice and the pain induced on touching the mucous membrane



FIG. 24.—Operation for vaginismus. Reflection of mucous membrane from the posterior vaginal wall.



FIG. 25.—Operation for vaginismus. Division of muscular fibres and consequent gaping of orifice.

of the vulva. So severe in some cases is the complaint that the thighs may be strongly adducted or even the body thrown into convulsions. In rare instances merely raising the clothes for the purposes of examination may start a spasm.

Prognosis.—The prognosis of this variety of vaginismus is not particularly hopeful. Unless it is cured it is most unlikely that the patient will become pregnant, but even if she should and give birth to a full-term child the complaint may still remain uncured.

Treatment.—Slight cases may be relieved by the application of a 5 per cent cocain ointment to the inner surface of the labia and round the vaginal orifice ten minutes before coitus is attempted. If this treatment fails coitus should be forbidden, and under an anaesthetic the vaginal orifice may be forcibly dilated with Sims' glass vaginal rests, a fairly large one being left in for some hours after recovery from the anaesthetic. The size of the rest should gradually be increased, and it should be

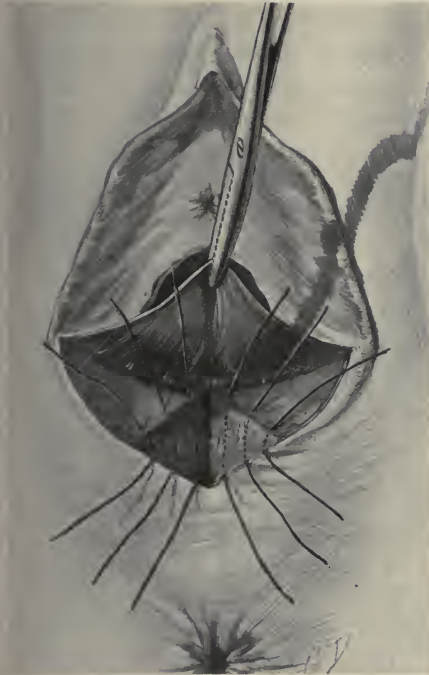


FIG. 26.—Operation for vaginismus.
Suture of diamond-shaped deep wound.

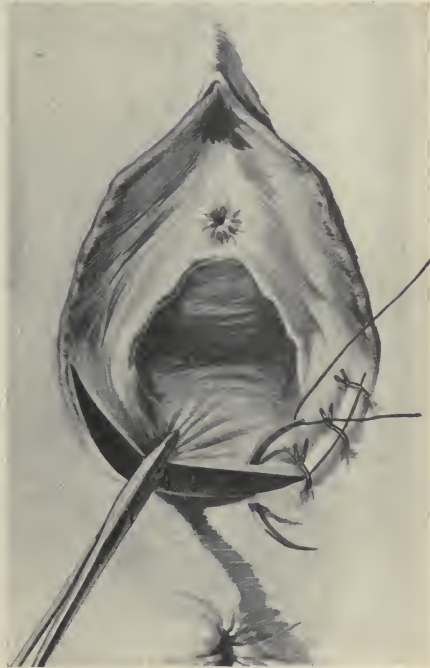


FIG. 27.—Operation for vaginismus.
Suture of the primary incision.

worn for two or three hours a day. Preparatory to its introduction some cocain ointment may be smeared on the parts. The best treatment, however, is to divide the sphincter muscles under an anaesthetic.

A flap of mucous membrane from the posterior vaginal wall is first reflected upwards (Fig. 24). An incision, 2 inches long, is then made in the long axis of the posterior wall of the vagina from just above the attachment of the hymen to half way to the anus (Fig. 25). The muscular fibres are thus divided, with the result

that the gaping wound is diamond-shaped. The wound, deep to the flap of mucous membrane, is then sutured with catgut, so that its upper angle is approximated to its lower angle, and the line of sutures, when complete, is transverse to the long axis of the vagina (Fig. 26). The edges of the primary incision are then united with interrupted catgut sutures (Fig. 27). When the operation is completed

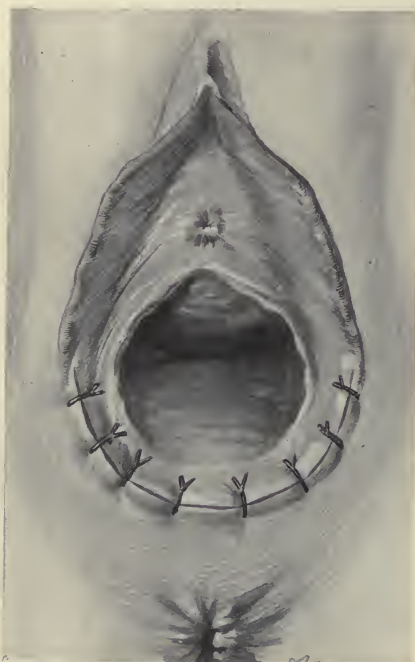


FIG. 28.—Operation for vaginismus. Completion of suture. Vaginal orifice enlarged.

the vaginal orifice is much enlarged (Fig. 28). A vaginal rest should be inserted and worn as already described.

Cases in which a Definite Cause is ascertainable.—In these cases the spasmodic contraction of the vaginal orifice is not so marked, and pain is the symptom more often complained of.

Causes.—A local examination of the vulva may reveal an inflamed unruptured or ruptured hymen, inflamed carunculae myrtiformes, a small ulcer or fissure in the fossa navicularis, small fissures or ulcers round the vaginal orifice, a urethral caruncle, haemorrhoids, or an anal fissure.

Symptoms.—The patient will complain of dyspareunia or sterility, but in this case the dyspareunia will be associated with pain more than difficulty.

Signs.—A local examination will detect the cause of the trouble, and if, on digital examination, care be taken to avoid as far as possible the tender spot

the finger may be introduced without any marked distress.

Prognosis.—The prognosis of this variety is very satisfactory, as cure practically always results.

Treatment.—The treatment must be directed to the cause, thus an inflamed hymen, carunculae myrtiformes, urethral caruncle, or haemorrhoids should be removed. Fissures may be divided and ulcers cauterized.

DISEASES OF THE URETHRA

The urethra may be inflamed, ulcerated, the seat of a new growth, the site of some congenital or acquired defect, or of an injury. It may also contain a calculus.

Inflammation of the Urethra

Inflammation of the urethra may be acute or chronic.

Acute Urethritis.—*Cause.*—According to Kelly and Burnam¹ acute urethritis is always gonorrhoeal in nature.

Symptoms.—The patient complains of great pain and burning on micturition, and this in itself may be a cause of reflex retention of urine.

Signs.—The mucous membrane of the urethra is very reddened and tender. The urethra as palpated along the anterior vaginal wall is found to be swollen and tender, and pus may be expressed from its orifice. The signs of gonorrhoeal vulvitis will most likely be present.

Treatment.—The treatment is similar to that already described for gonorrhoeal vulvitis and vaginitis.

Chronic Urethritis.—*Cause.*—Chronic urethritis may result from an acute attack of the disease, or it may be chronic from the first, when the infecting organism may be the colon bacillus or *staphylococcus pyogenes*. It may be caused by an urethral calculus or other foreign body.

Symptoms.—The symptoms of chronic urethritis are similar, though not so marked, to those of the acute variety. There is not any retention of urine.

Signs.—The mucous membrane of the urethra is redder than normal, and it may be possible to express a little pus from its orifice.

Diagnosis.—Cystitis and suburethral abscess will give rise to the same symptoms and may themselves be associated with a chronic urethritis.

Treatment.—The urethra should be painted once a week with silver nitrate, 5 per cent, and Kelly and Burnam¹ recommend that in obstinate cases and preparatory to such treatment the urethra should be dilated with Hegar's dilators up to 14 mm. three times at intervals of a week.

Urethral Abscess.—*Cause.*—Infection of an urethrocele results in the formation of an urethral abscess.

Symptoms.—The patient complains of pain in the region of the urethra and of painful micturition.

¹ *Diseases of the Kidneys, Ureters, and Bladder*, 1914, vol. ii. p. 578.

Signs.—An urethral abscess appears as a tender swelling in the anterior vaginal wall in the course of the urethra. Pressure on the swelling reduces its size, and is accompanied by an escape of pus from the urethra. A sound passed along the floor of the urethra will easily enter the abscess cavity.

Diagnosis.—The swelling has to be diagnosed from an inflamed vaginal cyst (see p. 61).

Treatment.—The pus should be evacuated and the sac of the abscess removed by an incision through the anterior vaginal wall.

Suburethral Abscess.—*Cause.*—A suburethral abscess is caused by the infection of a dilated Skene's gland. The symptoms correspond to those of an urethral abscess, except that the swelling will not be so large, and unless the abscess has ulcerated into the urethra it will not be possible to pass the point of a sound into the abscess cavity. The diagnosis and treatment are similar to those of an urethral abscess.

Ulceration of the Urethra

Ulceration of the urethra may be primarily traumatic, syphilitic, tuberculous, carcinomatous, or sarcomatous in nature, or it may be secondary to ulceration of the vagina or vulva from any cause. Such ulceration will not need further discussion here, and the reader is referred to the various sections dealing with the diseases indicated above.

Swellings of the Urethra

Suburethral Cyst.—*Cause.*—A suburethral cyst may be formed by dilatation of Skene's glands, which are situated in the posterior wall of the urethra just internal to the urethral orifice.

Symptoms.—Unless inflamed or the seat of an abscess a suburethral cyst will not cause any symptoms.

Signs.—The cyst presents as a small cystic swelling in the anterior vaginal wall, just posterior to the urethral orifice. Its size can be reduced by pressure on it forcing its contents into the urethra.

Diagnosis.—It has to be distinguished from a vaginal cyst (see p. 61).

Treatment.—The cyst should be excised.

Urethral Caruncle.—There are two varieties of urethral caruncles : (1) granulomata; (2) innocent new growths.

Granulomata.—These tumours are composed of granulation tissue covered with stratified squamous epithelium. They are of inflammatory origin, due to the chronic

infection of the terminal portion of the urethra and of the urethral glands, and are situated on the posterior wall of the urethra near its orifice.

Innocent New Growths.—Innocent new growths of the urethra can be classified as papillomata, adenoma, and angiomata, according to whether the epithelium, glands, or blood-vessels contained therein are most marked, but they do not form distinct varieties of tumours, the difference is purely one of degree. Nerve-elements have not been found in any of them. The cause of these tumours is unknown. Rarely they are cystic. Urethral caruncles occur most frequently between the ages of forty and sixty, and more often in women who have had children than in those who are sterile.

Symptoms.—Urethral caruncles may not give rise to any symptoms, or they may be the cause of painful micturition before or after the act. Frequency of micturition and at times reflex retention of urine, from the anticipated pain, may be present.

Dyspareunia is a fairly common symptom, and occasionally pain on walking or sitting, and pruritus vulvae are complained of.

The reason why one caruncle should be painful and another not has never been determined, the most likely explanation being that the painful ones are associated with urethritis.

Signs.—Urethral caruncles are red in colour, some lighter than others.

They are almost invariably situated on the posterior urethral wall; they may be pedunculated or sessile, and tender or not, as the case may be (Fig. 29).

Prognosis.—Urethral caruncles, if properly removed, rarely recur, but this they are very apt to do if their excision is not sufficiently free. A recurring urethral caruncle, after free excision, should excite a suspicion of malignancy. Carcinoma of the urethra has developed under these circumstances, and it is safer to have all caruncles microscoped after removal.

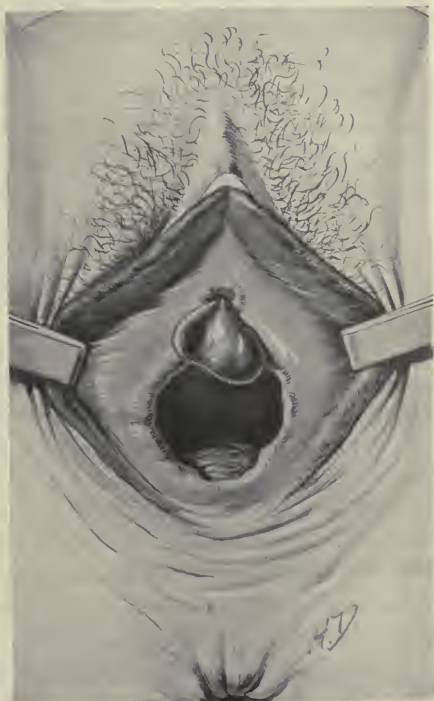


FIG. 29.—Urethral caruncle.

Diagnosis.—An urethral caruncle on a casual inspection may be mistaken for prolapse of the urethral mucous membrane (see p. 46).

Treatment.—The caruncle should be freely removed. The urethral orifice should be dilated with a few sizes of Fenton's dilators, after which the caruncle is seized with dissecting forceps and its pedicle or base excised from the urethral wall, care being taken to ensure the complete removal of the growth. The raw surface is then cauterized with the actual cautery, a Fenton's dilator being held in the urethra meanwhile, to prevent the anterior wall being also cauterized with the consequent risk of stricture.

Mucous Polypus and Fibroma.—These tumours of the urethra are rare, but a few cases have been recorded. Kelly and Burnam (*loc. cit.*) give a *résumé* of them. If there is any doubt as to the nature of the growth a microscopical examination will determine it.

Carcinoma of the Urethra

The carcinoma may be primary or secondary to disease of the uterus, vagina, vulva, or bladder.

Primary Carcinoma.—*Cause.*—Primary carcinoma of the urethra is rare. This may be partly due to the fact that the precancerous condition of leucoplakic vulvitis never affects the vestibule or urethral orifice.

Several cases of carcinoma of the urethra have occurred in connection with urethral caruncles, and this, together with the fact that the vulvo-urethral variety of carcinoma occurs more frequently than the entirely urethral carcinoma, suggests that chronic inflammation may play a part in its etiology.

The disease generally occurs in women over fifty years of age, and is either squamous-celled, commencing in the epithelium of the urethra, or, more rarely, columnar-celled, commencing in the peri-urethral glands.

Symptoms.—The early stages of the disease do not give rise to any symptoms. Later the symptoms are painful and difficult micturition, haemorrhage, discharge, and pain. The pain is worse when ulceration has occurred. Haemorrhage is the leading symptom in the papillomatous type and difficulty in micturition or retention in the sclerosing type.

Signs.—Beckwith Whitehouse¹ has analysed 43 cases and classifies them as follows:

Vulvo-urethral Growths.—1. An irregular, dark-purple, papillomatous growth which bleeds easily on contact and which may be mistaken for an urethral caruncle.

¹ *Journ. of Obstet. and Gyn. of the Brit. Emp.* vol. xx. No. 6.

2. An ulcer produced by the breaking down of a nodule on the floor of the vestibule at the urethral orifice.

3. An induration surrounding the urethral orifice and leading to its contraction.

Urethral Growths.—1. An irregular elongated ulcer, only to be seen by urethroscopic examination.

2. A peri-urethral induration, involving in time the whole length of the urethra.

In the later stages ulceration occurs in all the types and they cannot be differentiated. The ulceration, which has the usual malignant characters, spreads over the vestibule on to the labia minora, and rarely the bladder is involved.

Treatment.—The urethra and inguinal glands should be excised if possible. If the whole of the urethra has to be sacrificed the wound should be closed and the bladder drained suprapubically. If only part of the urethra is removed the mucous membrane of the remainder should be stitched to the anterior vaginal wall. In advanced cases where an operation is contra-indicated X-rays or radium may be tried.

Secondary Carcinoma.—Carcinoma secondary to malignant disease of the uterus, vagina, and vulva is easily identified on inspection. It leads to painful micturition and retention of urine.

Sarcoma of the Urethra

Sarcoma of the urethra is extremely rare. Up to 1911 only 14 cases had been published. Two of these cases occurred in women over fifty and one a myxosarcoma in a baby three months old.

Kelly and Burnam give the following as typical of sarcoma of the urethra:

Symptoms.—The patient will have noticed a swelling at the urethral orifice for some time, associated after a while with bleeding and a watery odourless discharge.

Signs.—A livid tumour will be seen protruding from the urethral orifice; it is divided by deep fissures and bleeds on being touched. A section of the tumour will show that it is moderately firm, brain-like, greyish in appearance.

Diagnosis.—A sarcoma of the urethra may have the appearance in its early stage of a mucous polypus of the urethra, or the prolapsed mucous membrane on microscopical examination of the growth will determine its nature.

Treatment.—The treatment is similar to that of carcinoma.

Congenital and Acquired Defects of the Urethra

Congenital Defects.—The congenital malformations of complete or partial absence of the urethra, imperforate urethra, deficiency in the floor of the urethra (hypospadias) or in the roof of the urethra (epispadias) are dealt with later and in Vol. I. p. 275.

Acquired Defects. Stricture of the Urethra.—*Cause.*—A stricture of the female urethra is very uncommon. It may be due to cancer, to syphilis, or to tubercle, to gonorrhoeal urethritis, to cicatricial contraction following a wound caused by child-birth, by an operation, or by cauterization of the urethra.

Symptoms.—The patient complains of pain and an increasing difficulty or inability to pass urine together with symptoms attributable to the cause. Later, cystitis and an ascending infection of the kidneys may result.

Signs.—If the stricture is due to cancer the growth will be seen, as may also the scars resulting from cicatrizing ulcers or wounds on the anterior vaginal wall. With gonorrhoeal stricture the urethra is felt as a hard cord. The passage of a catheter will be resisted and the stricture can be seen with the urethroscope.

Treatment.—The stricture may be dilated, incised, or excised; or if a growth is the cause this may be removed. Where none of these methods is feasible the bladder must be drained above the pubis, unless an urethro-vaginal fistula can be made by opening the urethra behind the stricture into the vagina, and suturing it to the vaginal wall.

Prolapse of the Urethra

Prolapse of the urethral mucous membrane may be acute or chronic.

Acute Prolapse.—In this variety the mucous membrane of the urethra is prolapsed through the urethral orifice during defaecation. The colour of the protruded mass is purple or black owing to its strangulation. The lumen of the urethral canal can be seen in the *centre of the swelling*. The patient complains of severe pain and frequency of micturition. The prolapsed mucous membrane may bleed.

Chronic Prolapse.—In this condition the mucous membrane of the lower part of the urethra becomes prolapsed through the urethral orifice forming a red fringe. The prolapsed mucous membrane is found attached to the urethral orifice. The patient may complain of pain or frequency of micturition and occasionally of dyspareunia.

Treatment.—*Acute Prolapse.*—The patient should be placed under an anaesthetic and the prolapsed mucous membrane reduced. If this is impossible the treatment for chronic prolapse must be followed.

Chronic Prolapse.—The prolapsed urethral mucous membrane is seized with pressure forceps and put on the stretch. The entire mass is then transfixed with a catgut suture (Fig. 30). That portion of the mucous membrane anterior to the suture is next removed (Fig. 31), after which the suture as it passes across the

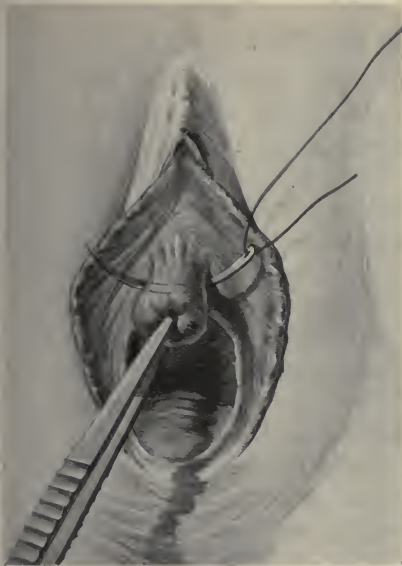


FIG. 30.—Excision of prolapsed urethra. Transfixion of the urethral mucous membrane with a catgut suture.

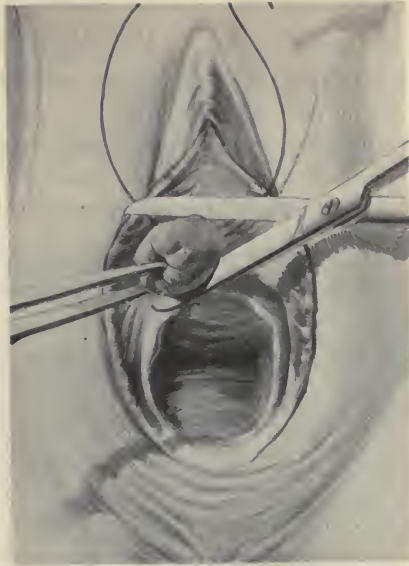


FIG. 31.—Excision of prolapsed urethra. Excision of the mucous membrane anterior to the suture.



FIG. 32.—Excision of prolapsed urethra. Division of the transfixing suture.

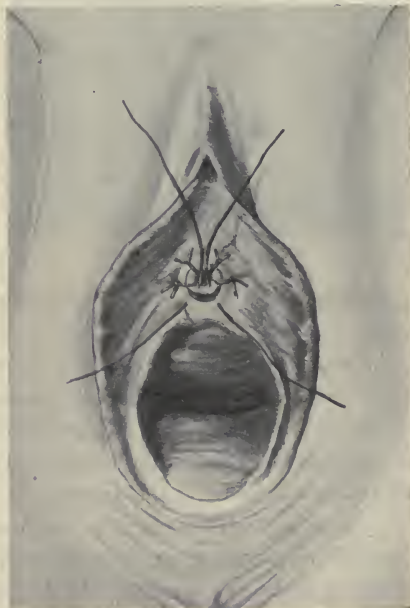


FIG. 33.—Excision of prolapsed urethra. Position of sutures.

urethral canal is pulled down and divided (Fig. 32). There are thus two sutures one on each side, which are tied, and afterwards as many sutures as may appear to be necessary are inserted between the urethral orifice and the cut edge of the mucous membrane (Fig. 33).

Urethrocele.—*Cause.*—A sacculated dilatation of the middle of the posterior wall of the urethra may be due to injury at child-birth; the cause cannot always be determined.



FIG. 34.—Urethrocele.

Symptoms.—The patient complains of frequent micturition, and when after a little while the urethra becomes inflamed from decomposition of the retained urine, of painful micturition. Owing to the urine collecting in the sac it is apt to be expelled on any exertion.

Signs.—A cystic swelling is seen in the anterior vaginal wall in the line of the urethra (Fig. 34). The swelling is cystic and will disappear on pressure. A sound passed into the urethra will easily enter the sac.

Diagnosis.—An urethrocele has to be diagnosed from a vaginal cyst and a suburethral cyst and abscess (see pp. 42-59).

The expulsion of urine from the sac may simulate vesical incontinence.

Treatment.—The sac should be excised through an incision in the anterior vaginal wall.

Urethral Calculus.—*Cause.*—A calculus of the urethra is rarely found. It may be due to the deposit of phosphates round a foreign body which has been introduced into the urethra, or round a migrated and unabsorbed ligature used in some operation in the neighbourhood of the urethra. It may have been expelled from the bladder and become arrested in the urethra.

Symptoms.—If the calculus is gradually formed in the bladder, the patient will complain of painful micturition and a gradually increasing difficulty in the act. If it sets up cystitis or ulcerates into the vagina, the patient will complain accordingly.

A calculus expelled from the bladder may be large enough to cause retention of urine.

Signs.—The urethra will be tender, the calculus may be felt through the anterior vaginal wall, and on passage of a sound the calculus will be detected.

Treatment.—The urethra may be dilated and the calculus removed with forceps, or if too large for this the posterior wall of the urethra can be incised through the vagina and the calculus removed.

DISEASES OF THE VAGINA

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THE normal vaginal secretion is described in Vol. I. p. 98 ; its bactericidal property is due to the presence of the vaginal bacillus discovered by Döderlein.

VAGINAL DISCHARGES

Pathological Discharge from the Vagina.—In this case the secretion is alkaline or only slightly acid, and whilst the vaginal bacillus is absent one or more of the following micro-organisms may be present—streptococcus, gonococcus, pneumococcus and diphtheroid bacilli, *staphylococcus albus*, and *bacillus coli*.¹

A pathological vaginal discharge flowing from the vagina does not necessarily indicate that this organ is the seat of disease. The discharge may be coming from the neck or body of the uterus ; from the Fallopian tube ; from the bladder, rectum, or ureter ; from the peritoneal cavity ; or from the cellular tissue. Such a discharge may be leucorrhoeal, mucous, purulent, watery, or bloody in character, or it may be a combination of one or more of these. It may also be offensive in odour.

Leucorrhoeal Discharge from the Vagina.—A leucorrhoeal discharge of the vagina may be due to an excessive normal secretion, or to the congestion caused by the pressure of a pregnant uterus or of a tumour, on the pelvic veins.

Mucous Discharge from the Vagina.—A mucous discharge of the vagina is very rare. It may be due to the rupture of a mucous cyst of the vagina, or to *adenomatosis vaginae*, in which the surface of the vagina is beset with racemose mucous glands.

Purulent Discharge from the Vagina.—A purulent or muco-purulent discharge of the vagina is due to vaginitis or to septic, syphilitic, tuberculous, or malignant ulceration. The pus is yellow, or green if the *bacillus pyocyaneus* is present. In

¹ See also Article on Types of Micro-Organisms met with in the Female Genito-Urinary Tract (Vol. I. p. 97).

some cases the discharge is offensive. Ulceration of a vaginal tumour, especially if it is malignant, will give rise to a very offensive discharge, as also may a neglected pessary or other foreign body.

Watery Discharge from the Vagina.—A watery discharge of the vagina may be due to rupture of a vaginal cyst or to ulceration of a malignant vaginal tumour, in which case it is most often blood-stained and very offensive.

Bloody Discharge from the Vagina.—A bloody discharge of the vagina is due to ulceration or injury.

INFLAMMATION OF THE VAGINA

Vaginitis is an uncommon disease. This is partly due to the structure of the mucous membrane lining the vagina, which consists of several layers of stratified epithelium and is free of glands, thus forming a difficult barrier for organisms to penetrate; and partly due to the character of the normal vaginal secretion which is bactericidal. In all cases of vaginitis it is important to identify the infecting organism with a view to treatment, and in certain cases also with a view to any legal proceedings which may be possible.

Cause.—Vaginitis in unmarried women may be due to gonococcal infection. In married women the same organism may be the cause of the disease. Vaginitis may also be due to a septic puerperal infection; to injuries resulting from the introduction of foreign bodies into the vagina, most commonly a pessary which has not been properly attended to; to operations; to the application of too strong chemicals, or the administration of too hot douches. The vagina may also be secondarily infected from septic conditions of the vulva or uterus. Chronic vaginitis is most often primary, less frequently it follows an acute attack.

Vaginitis in children is most often due to gonorrhoea resulting from a criminal assault or from infection by such articles as napkins, towels, underclothing, bed linen, enema-syringes, bath-water, lavatory-seats, bed-pans, etc., which have been contaminated by an adult or child who already has the disease. Serious epidemics of gonorrhoea due to such contamination have been reported as occurring in boarding-schools, Institutions, in Asylums, and in the children's wards of hospitals.

In children such conditions as malnutrition, the acute specific fevers, the bacillus coli, and oxyuris vermicularis, are sometimes found in association with vaginitis. Small foreign bodies inserted into the vagina by the mentally deficient may set up vaginitis, whilst in some cases a most careful examination of the child or her surroundings may fail to identify the source of infection.

Acute Vaginitis.—*Symptoms.*—The patient complains of heat, pain, and throbbing in the vagina, of a profuse discharge, and of symptoms attributable to a rise of temperature if this be present. In addition there may be pain on micturition and defaecation.

Signs.—The vaginal mucous membrane is red, tender, hot, and perhaps swollen. The papillae become infiltrated with leucocytes, and projecting give the mucous membrane a roughened appearance. At first dry, the mucous membrane is soon moist from a purulent or muco-purulent secretion. The labia and internal surfaces of the thighs become red, and, in children especially, eczematous from contamination with the irritating discharge.

Chronic Vaginitis.—*Cause.*—Chronic vaginitis most often results from infection.

Symptoms.—The patient complains of a discharge and pain in the vagina and vulva. To these may be added in some cases dyspareunia and pain on micturition.

Signs.—There is an increased redness of the vaginal mucous membrane, either uniform or patchy; and a yellow or green muco-purulent or purulent discharge varying in amount, but at times very profuse, is present.

Senile Vaginitis.—With the advent of the normal menopause or following that induced by operation, a condition known as senile vaginitis may be met with.

Symptoms.—The patient complains of a purulent or watery discharge which is at times profuse and often tinged with blood.

Signs.—At first red patches are seen on the mucous membrane of the vagina, which is quite smooth, and later some of these ulcerate with the result that the vaginal canal is narrowed as the opposing surfaces of ulceration become adherent.

Granular Vaginitis.—*Cause.*—Granular vaginitis is extremely rare, and is nearly always due to the gonococcal infection in a pregnant woman.

Symptoms.—The disease gives rise to pain and a copious yellowish-green discharge.

Signs.—The vaginal walls are the seat of numerous small hard nodules of a deeper red than the rest of the mucous membrane.

Emphysematous Vaginitis.—*Cause.*—This is a rare disease, and like granular vaginitis has been observed most often in women, the subjects of gonorrhoea during pregnancy, or in the puerperium.

Symptoms.—The patient complains of vaginal pain and a discharge.

Signs.—Scattered over the vaginal walls are small hard purple papules. These papules then become pustular and lastly fill with gas, which can be detected by puncturing them after the vagina has been filled with water. The gas is formed by the *bacillus aërogenes capsulatus*.

Membranous Vaginitis.—*Cause.*—This variety of vaginitis may be due to infection of a wound of the vagina caused by a neglected pessary or other foreign body. It may also be due to caustics or scalding, to infection by the diphtheritic bacillus or *oidium albicans*, and it may occur during the course of one of the acute specific fevers. A few cases have been reported in which complete casts of the vaginal mucous membrane were shed in patients apparently quite healthy.

Signs.—The necrosed mucous membrane may form a complete cast of the vagina or it may be discharged in pieces. The diphtheritic membrane is dark grey, or it may be green in colour with patches of reddish blue. The membrane due to *oidium albicans* is raised, white in colour, and has an area of increased redness surrounding it.

Diagnosis of Vaginitis.—The nature of the organism causing the vaginitis may be disclosed by an examination of the discharge. In the case of the gonococcus, however, its detection is often very difficult and its absence would not necessarily negative it as the cause, since it disappears quickly from the vagina, when secondary infective organisms only may be discovered. The gonococcus may be found for a longer period in the cervical canal and urethra.

The history of the case may be of considerable help in elucidating the cause of the vaginitis, together with the age of the patient, the presence of a growth or foreign body in the vagina, or of disease in the uterus or vulva.

Gonococcal vaginitis commences suddenly, and, as a rule, the local condition is more acute than when the infection is due to some other organism. Vulvitis is commonly associated with it, and other complications may be present; thus the inguinal and Bartholin's glands may become inflamed and suppurate. Painful micturition due to infection of the urethra is a marked symptom.

Sinclair¹ gives the results of his investigations by means of a urethroscope in 83 infants, under three years of age, suffering from vulvo-vaginitis. In every case a vulvar smear was taken at once and a bacteriological examination made. All positive and suspicious cases were isolated from other patients in the hospital, and within twenty-four hours an examination of the cervix and vaginal mucosa was made with the urethroscope and a smear taken from the vagina. In 10 cases in which the complement fixation test was employed 5 showed a positive reaction.

Of the 83 cases examined 16 were found to be infected with the gonococcus at the time of admission or to be highly suspicious of such infection. Seven cases negative on admission subsequently developed a specific vaginitis, and 9 cases

¹ *Arch. of Pediatrics*, January 1914.

illustrated the tendency to latency in this disease. This author states that 21·74 per cent of the cases would have escaped detection without the use of the electric-lighted urethroscope.

Complications of Vaginitis.—The sequelae of a septic or gonorrhoeal vaginitis may be most serious. The infection may spread along the genital canal, causing cervicitis, endometritis, salpingitis, salpingo-oöphoritis, pyosalpinx, and septic peritonitis. It may spread along the urinary tract, causing urethritis, cystitis, and pyelitis. Ulceration of the vagina may result in its constriction or in the formation of a recto-vaginal or vesico-vaginal fistula. Ophthalmia, arthritis, proctitis, endocarditis, and septicaemia may be directly due to gonococcal infection; the gonococcus may also be the cause of puerperal sepsis. The most common complications in children are ophthalmia and proctitis.

Treatment of Acute Vaginitis.—The majority of patients suffering from acute vaginitis do not apply for treatment until the subacute or chronic stage has been reached. Acute vaginitis requires very careful treatment, since serious complications may follow the infection if it is not checked in its early stages.

To minimize the dangers of extension the patient is best kept at rest in Fowler's position. The bowels should be regulated by aperients, alcohol prohibited, and if the infection is due to the gonococcus, sandal-wood oil, cubebs, or copaiba may be administered internally. A culture of the vaginal discharge should be made in order that the nature of the infecting organism may be identified and a vaccine prepared if required.

Acute gonorrhoeal vaginitis requires vigorous treatment which should be carried out as follows :

After the patient has been anaesthetized the vagina should be well douched with several pints of carbolic acid lotion, 1 in 40, or biniodide of mercury, 1 in 4000. The vaginal walls and cervical canal should next be swabbed with a solution of glycerine and carbolic, 1 in 10, after which the vagina should be again well douched and an iodoform tampon inserted. The tampon should be removed next day, and afterwards a vaginal douche of lead lotion should be administered twice daily until the inflammation has subsided.

By such treatment it is sought to destroy the gonococci in the epithelial cells, and a bacteriological examination will in a large number of cases prove that this object has been attained.

If the patient refuses to submit to this treatment it will be impossible, owing to the great local tenderness, to do more than prescribe remedies for the pain. Thus vulvitis, if it is present, can be relieved by hot hip-baths, and the vaginal pain may

be controlled with a morphia suppository or by pouring into the vagina an ounce of starch solution containing a drachm of laudanum.

As soon as vaginal treatment can be tolerated douches containing boric acid $\frac{3i}{\text{to}}$ to $\text{O}i$, or lead lotion $\frac{3i}{\text{to}}$ to $\text{O}i$, should be administered every four hours, several pints at a time. In addition, once a day, the vaginal walls and cervical canal should be swabbed with a 10 per cent solution of melargen or nargol. The number of douches and applications should be gradually reduced to two a day and once a week respectively, and this treatment should be continued until a bacteriological examination of the vaginal contents shows that the disease is cured.

The great danger of other people becoming infected by using the same towels and appliances, etc., should be carefully pointed out to the patient, and she must be warned that gonorrhoeal ophthalmia will result if any of the discharge is conveyed to her eyes. Infants especially, who are unable to appreciate the importance of this fact, should have their hands restrained.

For the treatment of the various complications following an attack of acute vaginitis the reader is referred to the sections dealing with them.

If the vaginitis proves difficult to cure, the patient may be treated with a gonococcic vaccine, prepared if possible from the organism isolated from the patient. This treatment while at times successful is often disappointing and fails to induce any improvement. The uncertain results associated with treatment by a gonococcic vaccine prepared in the usual way are said by Nicolle and Blairot to be due to the present crude methods of sterilizing the living cultures, to the more or less constant toxicity and unstable nature of the vaccine, and to the absence of a proper proportion of another organism which they claim to have discovered, which they call the *synococcus*, and which they state is always found in association with the gonococcus. Nicolle and Blairot prepared a vaccine consisting of nine parts of *synococcus* and one part of gonococcus and sterilized it by a new method which they claim makes it non-toxic and stable. These authors report wonderful results following the use of this vaccine, which they call "Dmegan."

Donaldson¹ has contributed a critical review on the results of treatment with "Dmegan," and concludes that this vaccine has not completely fulfilled the claims of the authors and their colleagues. Judging from the reports "Dmegan" does not always cure and is not always atoxic. The majority of the cases, however, seem to have benefited, and it is especially remarked how quickly the pain in arthritis has been relieved and how rapidly ophthalmia has cleared up.

¹ *British Medical Journal*, November 14, 1914.

The dosage is 250 millions (25 million gonococci and 225 million synococci) and is best injected into the muscles.

In chronic cases it should always be remembered that gonorrhoeal cervicitis or endometritis may be the cause of the persistent vaginitis, and such condition may need curettage followed by the application of strong antiseptics, such as pure carbolic acid, chloride of zinc, 30 grains to ten ounces of water, or even pure nitric acid. If this latter chemical is used the uterus, following its application, must be at once douched with a saturated solution of carbonate of soda to avoid ulceration and atresia of the cervical canal.

If in spite of all this treatment the discharge still continues, the question of hysterectomy will have to be considered, especially if the Fallopian tubes have already been removed.

Sinclair found that the best treatment for children consisted in irrigating the vagina with potassium permanganate $\frac{1}{8000}$, and afterwards applying a 20 per cent organic silver solution. When the discharge becomes scanty a $\frac{1}{10000}$ solution of hydrochloric acid should be substituted for the potassium permanganate solution. The douche may be given through a male rubber catheter. For the eczematous condition of the vulva and thighs warm baths, followed by a complete drying of the parts and the application of an ointment consisting of equal parts of oxide of zinc and castor oil, will be found useful. This author also points out that prophylaxis to be effective must begin with a campaign in the Homes and Institutions where infants are born and reared, with the exercise of adequate medical supervision and isolation of infected cases until free from the specific organism; and systematic periodic examinations of all the inmates of institutions for young children should be made in order to detect cases and procure their isolation before they become centres of infection.

Acute septic vaginitis should be treated by removing the cause if possible and by the administration every four hours of vaginal douches containing boric acid 3i to Oi or lead lotion 3i to Oi at a temperature of about 100° F. In most cases these measures will suffice to cure the patient. In addition swabbing with one or other of the silver salts may be tried.

Chronic Vaginitis.—Chronic gonorrhoeal vaginitis is often very difficult to cure. The general treatment prescribed for acute vaginitis should be followed but the patient need not be kept in bed. As with acute vaginitis a bacteriological examination should be made of the vaginal discharge, and a culture should also be taken from the cervical canal and urethra, as the gonococcus may be found in the mucous crypts of these canals long after it has disappeared from the vagina.

The following astringent douches will be found useful—sulphate of zinc ʒi to Oi, chloride of zinc gr. 3 to Oi, sulpho-carbolate of zinc ʒi to Oi, and a douche containing alum, sulphate of zinc, and boric acid of each grains 80, and tannic acid ʒi to Oi of water. These chemicals can be better applied to the vaginal walls through the medium of soluble vaginal pessaries. Local applications of organic silver preparation as mentioned under acute vaginitis will also be useful.

If the cervical canal or the urethra is found to be infected it should be swabbed with melargen or nargol, or iodized phenol (liquefied carbolic acid 4 parts, iodine 1 part) on a Playfair's probe, since it will be impossible to cure the vaginitis when a source of reinfection remains uncured.

Chronic septic vaginitis must be treated by removing the cause if possible. The local treatment may follow on the lines already indicated under chronic gonorrhoeal vaginitis and is often more rapidly successful. Vaccine treatment is also more successful. The vaccine should be prepared from the organisms isolated from the vaginal discharge of the patient.

ULCERATION OF THE VAGINA

Ulceration of the vagina may be due to trauma, cancer, tubercle, syphilis, diabetes, or erysipelas. A rare variety known as the "round ulcer" is also described.

Traumatic Ulceration.—Traumatic ulceration may be due to the pressure of foreign bodies which have been inserted into the vagina, most generally to ill-fitting or neglected pessaries; it may also be due to the infection or lacerations of the vagina caused by child-birth, criminal assault, or operative procedures; to pressure of the head in neglected labour; and to friction of the prolapsed vagina in cases of procidentia. The ulceration may extend into the bladder or rectum. Very rarely gangrene supervenes on some injury to the vagina, generally that due to child-birth or to attempts at procuring abortion. It has been reported to have occurred without any known cause.

A traumatic ulcer may simulate a malignant ulcer or may become malignant, and suspicion should be particularly aroused if the adjacent tissue is indurated and bleeds easily on palpation.

Malignant Ulceration.—A malignant ulcer has raised indurated edges, the base is indurated, and it soon becomes fixed. It gives rise to an offensive watery blood-stained discharge, and the inguinal or pelvic glands are involved according to whether the ulcer is situated in the lower third or the upper two-thirds of the vagina. The ulceration may extend into the bladder or rectum, or both these organs may be involved.

Tuberculous and Syphilitic Ulceration.—For a description of these ulcers the reader is referred to Vol. I. pp. 589, 671.

Diagnosis.—If there is any doubt as to the character of the ulcer, a piece of it should be excised and submitted to microscopical examination.

Treatment.—The treatment of septic ulceration consists in removing the cause if one be found and in the administration of antiseptic vaginal douches. The fistulae caused by septic ulceration will at times close without further treatment, or the operative procedures described in Vol. III. p. 654, may be necessary.

Round Ulcer of the Vagina.—*Cause.*—This is a very rare variety of ulcer. The cause is not known. It is thought by some to be due to infection, and by others, when found in women of advanced age, to trophic or arterio-sclerotic changes. It has also been observed in young debilitated women.

Symptoms.—Apart from the purulent discharge there are not any symptoms.

Signs.—The ulcer is superficial, involving only the mucous membrane of the vagina. It is regular, rounded, has sharp non-indurated edges, and is not undermined. The base is red, flat, and covered with a thick odourless pus, and there are not any signs of inflammation of the adjacent tissue. It is always situated on the posterior vaginal *cul-de-sac*.

Prognosis.—The round ulcer has a tendency to spontaneous recovery.

Diagnosis.—The condition must be diagnosed from syphilitic, tubercular, and malignant ulceration by microscopical examination and the presence of other signs indicative of these diseases.

Treatment.—Antiseptic douches should be ordered and the ulcer should be swabbed with nitrate of silver or chloride of zinc, 1 in 10.

CYSTIC SWELLINGS OF THE VAGINA

Cause.—The mode of origin of vaginal cysts cannot be determined in all cases. It is certain, however, that some arise from vaginal glands, from embryonic structures persisting in the vagina, from changes in the vagina incidental to vaginitis, and from injuries to the vagina. Vaginal cysts have also been reported as being due to dilated lymphatics, to a vaginal haematoma, and to the echinococcus.

Cysts originating in Vaginal Glands.—In the normal vagina there are not any glands. In a few cases small spaces are found in the squamous epithelium lined with cylindrical epithelium. These spaces may become distended with fluid and then form small cysts about the size of a pea. Such cysts when present may be found anywhere in the vaginal wall.

Cysts due to the Persistence of Embryonic Structures.—The following embryonic

structures may persist in the vagina: Gartner's duct, remains of Müller's duct, and a misplaced ureter.

Gartner's duct in the foetus passes down from the epoöphoron in the broad ligament by the side of the body of the uterus or in the uterus itself, then in the cervix, and ends in the anterior or lateral wall of the vagina close to the hymen. As a rule, only that portion of the duct in relation with the epoöphoron remains in the adult. Occasionally, the duct may persist in its entire length, as has been proved by finding a broad-ligament cyst in communication with a vaginal cyst. More commonly one or more segments of the lower part of the duct may persist in the adult, and then, becoming distended with fluid, form one or more cysts, as the case may be. The most common situation for such a cyst to appear is in the anterior wall of the vagina just behind the urethral orifice. As a rule these cysts are single, but if multiple they present in a row. Generally quite small, these cysts have been known to fill the vagina, and while commonly sessile they may rarely be pedunculated. These cysts are always translucent and contain a watery fluid. On microscopical examination the cyst is seen to be covered with the atrophied stratified epithelium of the vagina, and the cyst-wall is composed of fibrous tissue, its inner surface being lined with cylindrical, cuboidal, or flat epithelium.

Müller's Duct.—If Müller's ducts fail to unite the result will be a double uterus and vagina. If the upper portions of the ducts fail to unite while the lower portions do unite the result will be a double uterus and a single vagina. If the upper portions only partially unite and the lower portions fail to unite the result will be a bicornute uterus with two vaginae. In some of these cases one cornu of the uterus is badly developed, and the corresponding vagina is quite rudimentary and is fused with the functional vagina. If fluid collects, as it may do, in the rudimentary vagina, a cyst apparently in the lateral wall of the functional vagina results. These cysts are lined with squamous epithelium.

Misplaced Ureter.—Cases have been reported in which a small cyst has presented in the lateral wall of the vagina, and when this was punctured an escape of urine resulted. There was not any history of injury in these cases.

Cysts due to Vaginitis.—A portion of the vaginal walls, following an attack of vaginitis, may become adherent. Enclosed spaces are thus formed, and an accumulation of fluid therein gives rise to a cyst. Small cysts filled with gas are rarely found in the submucosa of the vagina in pregnant women, the condition being known as emphysematous vaginitis.

Cysts due to Vaginal Injuries.—These are known as inclusion cysts and arise from tags of vaginal mucous membrane becoming buried in the stroma; they are

generally single and small. The smaller cysts are filled with desquamated epithelium of a yellow colour, the larger are full of clear fluid. The wall of the cyst is composed of fibrous tissue and it is lined with several layers of squamous epithelium. The tags of mucous membrane have become detached by the lacerations incidental to child-birth or by operations on the vagina, these cysts are therefore most often found in the lower third of the vagina on the posterior wall.

Cysts due to dilated lymphatics and vaginal haematomata have been reported.

Clinical Features of Vaginal Cysts.—Vaginal cysts do not cause any symptoms unless they become inflamed or are large enough to cause dyspareunia, difficulty at child-birth, retention of urine, or to protrude through the vaginal orifice.

Vaginal cysts, which are generally single and unilocular, are seldom larger than a Tangerine orange but may completely fill the vagina. The mucous membrane covering the cyst may become so thin that it is transparent (Fig. 35). The fluid from the cyst is watery in appearance and consistence. Vaginal cysts may suppurate and rupture, the opening remaining patent, in which case the cyst continues to discharge, or it may close when the cyst will refill.

Diagnosis.—A vaginal cyst has to be diagnosed from a cystocele, a rectocele, a unilateral haematocolpos, a post-urethral cyst or abscess, an urethrocele, an urethral abscess, a vaginal hernia, and from an echinococcus cyst.

The three first mentioned are dealt with in other parts of this work.

Suburethral Cyst and Abscess.—A cyst behind the urethral orifice may be due to dilatation of Skene's tubules, or if these become infected a suburethral abscess may result. Both these conditions form small cystic swellings on the anterior wall of the vagina. The abscess is tender and is associated with pain on micturition, whilst pressure on it may displace a little pus which will escape from the urethra and cause the cyst to become somewhat smaller. On the other hand, pressure on

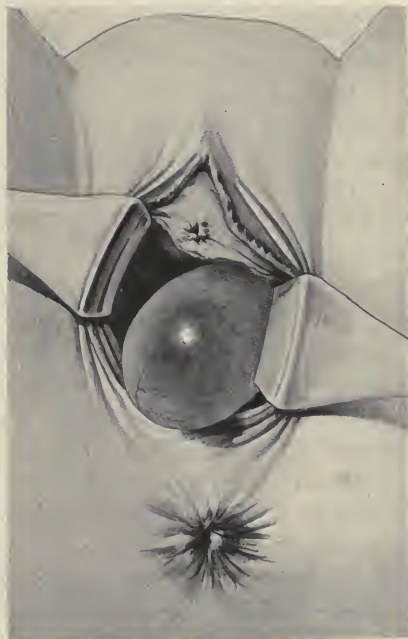


FIG. 35.—Cyst of the anterior vagina wall.

a vaginal cyst has no such result. When the abscess ulcerates into the vagina a track may be formed along which it may be possible to pass the point of a sound.

Urethrocele.—Dilatation of the middle third of the posterior wall of the urethra forms a cystic swelling in the anterior vaginal wall in the line of the urethra. This swelling will disappear on pressure, and the point of a sound passed into the urethra can be made to enter the urethral sacculation quite easily. There will be frequent and painful micturition due to inflammation set up by decomposition of the urine retained in the sac.

Urethral Abscess.—Inflammation of an urethrocele may result in an urethral abscess, when the swelling projecting into the vagina will become tender and hot, and pus can be expressed from the urethra.

Vaginal Hernia.—A coil of small intestine may force in front of it that portion of the vaginal wall between the bladder and the uterus or between the uterus and rectum, and so cause the rare condition of a vaginal hernia. Such a hernia presents in front of the cervix or at the anterior end of the perineum, and is diagnosed by the fact that it disappears with a gurgle on pressure; that it becomes more prominent on coughing; that it is not cystic to the touch; and that it may disappear spontaneously if the patient lies on her back with her buttocks raised.

Echinococcus cysts may develop in the recto-vaginal septum or burrow down by the side of the vagina from the broad ligament (Vol. I. p. 726). These cysts form projections in the vagina and may thus be mistaken for vaginal cysts. The nature of such a cyst will be diagnosed from the structure of the cyst wall and the presence of daughter cells and hooklets within it.

Treatment of Vaginal Cysts.—Vaginal cysts if small may be left alone. If causing symptoms they should be dissected out and the cut edges of the mucous membrane then carefully united. If the cyst is in the anterior wall it is exposed by inserting into the vagina Auvard's speculum, if the cyst is in the posterior wall it is similarly exposed by an anterior vaginal retractor held by an assistant. A sound should be passed into the bladder if the cyst is in the anterior vaginal wall, or a finger into the rectum if it is in the posterior vaginal wall, in order that the true relations of these organs may be ascertained. The mucous membrane covering the cyst is then incised, the object of the operation being to enucleate the entire cyst, for if it bursts, the removal of the collapsed cyst-wall may be very troublesome. The cut edges of the mucous membrane are retracted with pressure forceps and the cyst enucleated with the finger, handle of the scalpel, or scissors if necessary. Any excess of mucous membrane present after the cyst has been enucleated is trimmed off with the scissors and the cut edges are then united with catgut.

During this operation there is not any bleeding to speak of, but occasionally it may be serious, in which case the bleeding parts must be secured and ligatured with mattress sutures if necessary.

If the cyst is a large one it may encroach on the bladder, rectum, or ureter, and in removing such a cyst the operator must be careful that he does not injure any of these structures. An alternative procedure is to incise the cyst, plug the cavity, and let healing take place by granulation.

A detailed description of certain vaginal cysts will be found in the *Johns Hopkins Bulletin for 1900*, p. 279.

SOLID SWELLINGS OF THE VAGINA

Fibroma.—Fibromata of the vagina occur in women most commonly between the ages of forty and fifty, and in the unmarried as frequently as in the married.

Symptoms.—According to its position and size a fibroma may cause difficulty in micturition, and retention of urine from pressure on the urethra, haematuria from pressure on the ureter, constipation and haemorrhoids from pressure on the rectum, and projecting into the vaginal canal it may cause dyspareunia and obstruction to child-birth. If it projects through the vaginal orifice the patient may have difficulty in walking or sitting, and if it becomes ulcerated it will bleed and give rise to an offensive discharge. It may also cause backache and pain from pressure on the sacral plexus.

Signs.—The tumour is single and in most cases it is situated on the upper part of the anterior vaginal wall. It may be sessile or pedunculated, and it varies in size from a marble to a child's head, in the latter case either filling the vagina and presenting as an abdominal tumour or projecting outside the vulva orifice (Fig. 36). It is hard unless secondary changes have taken place in it, when it may become soft.

Diagnosis.—A fibroma of the vagina has to be diagnosed from a sarcoma in the same situation, and if it becomes soft and oedematous from a vaginal cyst.

Pathology.—A fibroma of the vagina is composed of connective tissue and a varying amount of muscular tissue. These tumours may become oedematous, or they may calcify, and cystic changes have been found in them.

Treatment.—The tumour should be exposed with a vaginal speculum or retractor and then seized with a pair of volsellum forceps and drawn down. If the tumour is pedunculated the mucous membrane covering its pedicle is incised and reflected,

after which the pedicle is divided or enucleated. Haemorrhage, if any, from the pedicle or site of the pedicle, is arrested with mattress sutures and the divided mucous membrane is then united with a continuous suture.

If the tumour is sessile, its relation to the bladder or rectum should be carefully investigated with the sound or finger. The mucous membrane covering the tumour is incised all round, after which its capsule is opened, or both may be divided by the



FIG. 36.—Fibroma of the vagina. The tumour is prolapsed and its lower part ulcerated. (Author's case.)

same incision. The tumour is then enucleated. Bleeding is arrested by securing individual vessels if necessary, but it is generally sufficient to pass the catgut sutures for uniting the mucous membrane underneath the raw surface left after the tumour has been enucleated. In addition to the bladder and rectum the ureters may be in relation with such a tumour, and the operator must be careful these structures are not injured during the operation.

Carcinoma.—Carcinoma of the vagina may be primary, or secondary to carcinoma of the uterus, or to carcinoma of the rectum. It may also supervene on ulcers of

the vagina associated with prolapse. A very rare variety is chorion-epithelioma, which may also be primary or secondary.

Primary carcinoma of the vagina is rare and is usually found in women past the menopause.

Symptoms.—For a long while primary carcinoma of the vagina may not give rise to any symptoms. Later the patient will complain of pain in the pelvis, rectum, or bladder, of haemorrhage, and of an offensive watery discharge. Pruritus is also a symptom.

Signs.—The growth begins as a rule in the upper third of the posterior vaginal wall, where it forms a flat indurated nodule (Fig. 37). This in time breaks down, forming an ulcer with raised and indurated edges. The ulceration may spread round the vagina and thus very markedly reduce its calibre. The growth may first come under observation as a fungating bleeding mass, but rarely it spreads round the vagina without breaking through the surface of the mucous membrane, a rigid tube resulting. The disease gradually involves the adjacent tissues, with the result that a fistula is formed between the rectum and the vagina, or between the bladder and the vagina, generally the former. The connective tissue in the neighbourhood of the growth becomes involved early, fixing the vagina at this point.

If the disease starts high up the pelvic glands are first involved, if it starts near the vaginal orifice the inguinal glands.

Pathology.—Carcinoma of the vagina is in the great majority of cases squamous in type, but an adeno-carcinoma arising in aberrant glands has been described.

Diagnosis.—The ulceration due to a neglected pessary sometimes becomes carcinomatous. The other conditions carcinomatous ulceration may be mistaken for are syphilitic and tuberculous ulceration. The ulcers of tertiary syphilis are not friable, and their base is covered with a greyish membrane. The surrounding



FIG. 37.—Primary carcinoma of the vagina.

tissue is not at all or only a little indurated, and the ulceration spreads more quickly, so that fistulae are soon formed. Tuberculous ulcers are not indurated, are flat, and have sharply-defined edges. There may be signs of tubercle in other parts of the

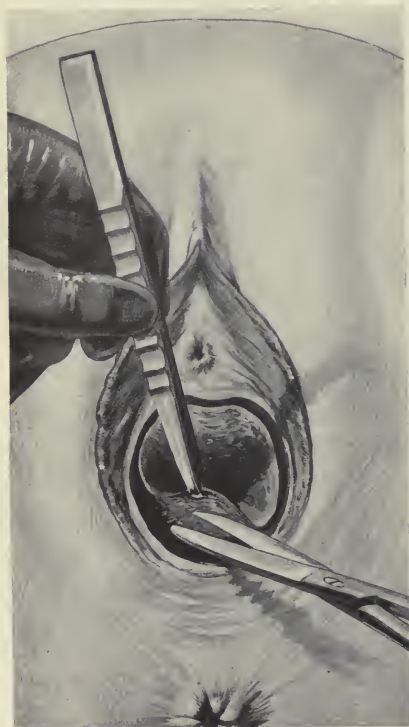


FIG. 38.—Separation of the vaginal mucous membrane.



FIG. 39.—Suture of the vagina over the diseased areas.

body. The nature of an early growth can be ascertained by microscopical examination. When the disease is advanced there is no difficulty in the diagnosis.

Treatment.—If the disease is detected in an early stage and is situated near the vulval orifice it can be removed by extirpation of the lower half of the vagina. If the disease is situated high up in the vagina it should be treated by the entire extirpation of the vagina and uterus. If the disease is in the lower two-thirds of the vagina it can be removed by a combined abdominal and vaginal operation or by a vaginal

operation only (*vide infra*). If the growth has involved the bladder or rectum, a radical operation is not feasible, and radium may be given a trial; but such treatment will be nearly certain to result in a vesico-vaginal or recto-vaginal fistula.



FIG. 40.—Stretching the vagina prior to its incision. The dotted line indicates the direction of the paravaginal incision.



FIG. 41.—Incision round the sphincter ani and through the anterior fibres of levator ani.

Removal of the Vagina and Uterus by the Vaginal Route.—This is best carried out by the method of paravaginal section as follows:¹

The patient having been prepared by the method described in Vol. III. p. 285, is placed in the lithotomy position.

The mucous membrane of the vagina is separated all round from its attachment to the vaginal orifice and is then carefully dissected back off the bladder and rectum

¹ Further reference to this procedure will be found in the Article on Hysterectomy (Vol. III. p. 470).—EDITORS.

up to the end of its cervical attachment (Fig. 38). The separated vagina is then pulled down, inverted, and its cut edges sewn together, thus forming a cuff which covers the cervix. The ends of the sutures are left long and will serve as a convenient tractor (Fig. 39).

The vaginal orifice is now stretched by the finger of the operator and his assistant



FIG. 42.—Bladder dissected off the supravaginal cervix. Note position of ureters.

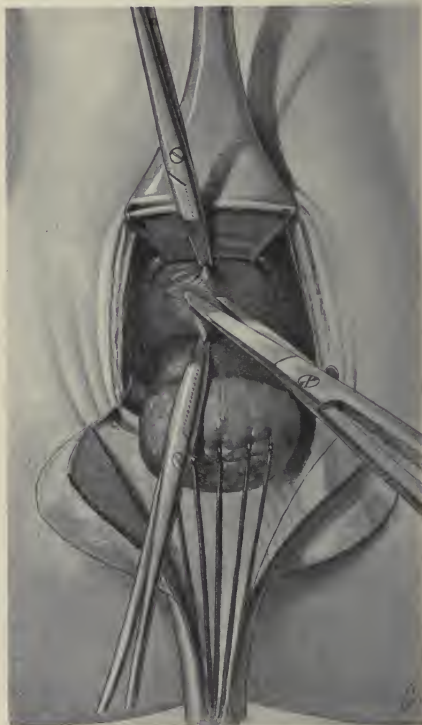


FIG. 43.—Bladder dragged upwards. Utero-vesical pouch being opened.

(Fig. 40), after which the paravaginal section is made by an incision commencing on a level with the cervix at the junction of the left lateral and posterior vaginal walls. This incision is carried round the sphincter ani and divides the anterior fibres of the levator ani with the result that a large amount of additional room is obtained (Fig. 41). All bleeding points are then secured with pressure forceps and ligatured with catgut.

Auvard's speculum having been inserted, the cervix is now pulled downwards

and backwards. The bladder is then dissected off the supravaginal cervix, and at its lateral angles the ureters can be clearly defined and are carefully dissected off the surrounding tissues (Fig. 42). A vaginal retractor is inserted under the bladder which is dragged upwards, and the utero-vesical pouch is opened by fixing the peritoneum, as it is reflected from the bladder on to the uterus, with a pair of forceps and incising it (Fig. 43).

The retractor is next removed, the cervix and vagina drawn forwards by an assistant, and the utero-rectal pouch is opened by fixing the lowest part of the peritoneum of the pouch of Douglas with a pair of pressure forceps and incising it (Fig. 44).

The uterus and vagina are then drawn over to the right side by the assistant, a vaginal retractor is inserted on the left side and pulled outwards, and the operator locating the left uterine artery by passing his finger up behind the broad ligament secures it with a Worrall's needle and catgut. The artery being thus secured, the uterus is partly freed on that side by dividing the parametric tissue as far out towards the lateral wall as possible. The same procedure is followed on the right side and the remaining uterine artery thus secured.



FIG. 44.—Cervix and vagina drawn forward. Utero-rectal pouch being opened.

The uterus is now only held by its round ligaments, the upper part of the broad ligaments and the ovarian vessels contained therein. It is freed as follows: The uterus having been dragged down as far as possible, the operator passes his finger behind the uncut portion of the broad ligament and by its means he guides Worrall's needle and with it transfixes this portion of the broad ligament. The needle is withdrawn and the ligature is cut, after which one half is carried over the pelvic edge of the broad ligament and tied, thus securing the ovarian vessels and the other half is brought below the

cut surface of the broad ligament and the round ligament thus secured. The parametric tissue on the distal side of the ligatures is then divided with scissors and the uterus freed on that side. By a similar procedure the right side of the uterus is freed, and the organ, together with the whole vagina, is removed.

In some cases it is easier to finish this last stage of the operation by anteverting the uterus first with the fingers, bringing it out below the bladder and fixing it with a volsellum (Fig. 45). Lastly the paravaginal incision is sutured by a series of deep interrupted sutures, and the large cavity left by removal of the organs is lightly plugged with sterile gauze.

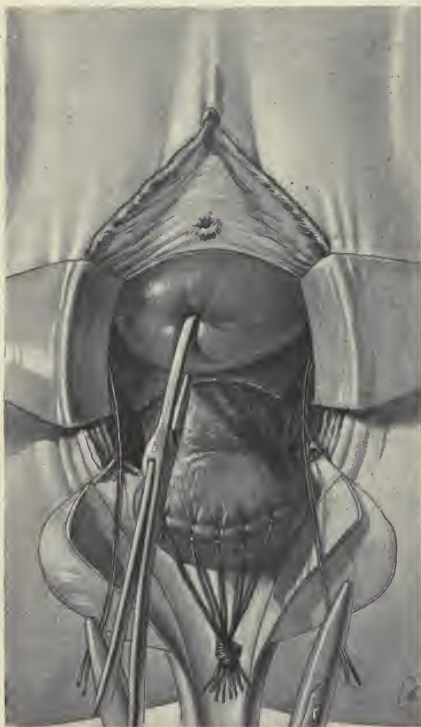


FIG. 45.—Anteverting the uterus prior to ligaturing the upper part of the broad ligament.

Such are the main details of this operation. In certain cases it may be necessary, on account of oozing, to ligature the parametric tissue in more sections than the two above described.

This operation has the great advantage over the routine vaginal hysterectomy that the ureters having been clearly exposed a wide dissection of the parametric tissue can be made (an all-important matter when the operation is being performed for carcinoma) without endangering them, whereas without the paravaginal section most of the parametric tissue has to be left and the ureters are always in danger of being wounded.

The after-treatment is described in Vol. III. p. 723.

Removal of the Vagina and Uterus by the Abdominal Method.—If the carcinoma is situated on the upper part of the vagina the diseased structure is best removed by the abdominal route; it is not necessary to remove the whole of the vagina. The operation is identical with that performed for carcinoma of the cervix and described in Vol. III. p. 489.

Removal of the Vagina and Uterus by the Combined Vaginal and Abdominal

Route.—There is no need to describe in detail this method. The vaginal portion of the operation consists in separating the vagina wall below the growth and then dissecting the vagina up to the level of the cervix, pulling it down, inverting it and suturing it so that it forms a cuff over the cervix, as described and illustrated on p. 67. The patient is then placed in the Trendelenberg position, and the abdominal part of the operation carried out as in the radical hysterectomy for carcinoma of the cervix.

Secondary Carcinoma.—Secondary carcinoma of the vagina may be due to a direct extension from the neck or the body of the uterus or from the rectum. It may also be due to a metastatic growth from carcinoma of the uterus or to implantation of cancer-cells in the process of removing the uterus for carcinoma of that organ.

The symptoms and signs are those of the primary disease. When secondary to extracervical carcinoma it is readily identified from the condition of the cervix.

Diagnosis.—The diagnosis usually depends on the presence of carcinoma in some adjacent organ. A metastatic growth, or one due to implantation, can be diagnosed by microscopical examination. If secondary to intracervical or corporeal carcinoma the first sign noticed may be the nodule in the vaginal wall. In a patient suffering from uterine haemorrhage, the presence of a hard painless nodule in the vaginal wall points strongly to its being a metastatic growth.

Treatment.—Carcinoma that has spread to the vagina from the cervix can be removed, if the case is otherwise suitable, when the uterus is removed by a radical hysterectomy (see Vol. III. p. 489).

Implantation tumours should be removed by a wide excision, and metastatic growths may be similarly treated if it is thought desirable.

Sarcoma.—Sarcoma of the vagina is very rare. It may be primary or secondary. Most of the cases occur in women between the ages of fifty and sixty and then below the age of thirty. It is also found in young children.

Symptoms.—The patient complains chiefly of pain, haemorrhage, an offensive watery discharge, and pruritus, whilst extension into the rectum or bladder causes incontinence of urine and faeces.

Signs.—In adults sarcoma appears either as a diffuse growth or as an indurated nodule forming a sessile tumour, usually on the anterior wall in the lower third of the vagina. The tumour grows quickly and soon breaks down disclosing an ulcerated surface which bleeds easily.

Diagnosis.—In its early stages a sarcoma of the vagina resembles in appearance a fibroma, and it may be impossible to arrive at a correct diagnosis without a

microscopical examination. Apart from microscopical examination the fact that a sarcoma grows quickly, causes pain and haemorrhage, and soon ulcerates, will serve to distinguish it.

Pathology.—The diffuse form is composed of round or mixed cells. When circumscribed the growth is unusually a fibro-sarcoma. Necrosis of the growth is a common occurrence.

Treatment.—The treatment is similar to that of vaginal carcinoma. The prognosis is very bad, most of the reported cases dying of recurrence.

Sarcoma of the Vagina in Children.—*Symptoms.*—Very frequently the first complaint made is that relating to the appearance of the growth at the vulva. Pain is only complained of when the growth is distending the vagina or causing retention of urine, and often when the growth projects through the vulval orifice the pain disappears. Ulceration occurs, when bleeding and an offensive discharge ensue.

Signs.—The growth usually appears first on the anterior wall of the vagina and forms a small smooth swelling. Growth from the surface of the tumour at different spots rapidly takes place so that a grape-like tumour results, the so-called *sarcoma botryoides*, distending the vagina and eventually projecting beyond the vulval orifice.

The grape-like masses are somewhat transparent and contain a yellow fluid; they are greenish in colour unless haemorrhage has taken place in them. Septic ulceration usually occurs early and the patient dies from the effects.

Prognosis.—The prognosis of vaginal sarcoma in children is bad. The disease progresses quickly and in most cases soon terminates fatally. In a few cases the disease has been prolonged for a year or more.

Treatment.—If feasible the growth should be widely excised.

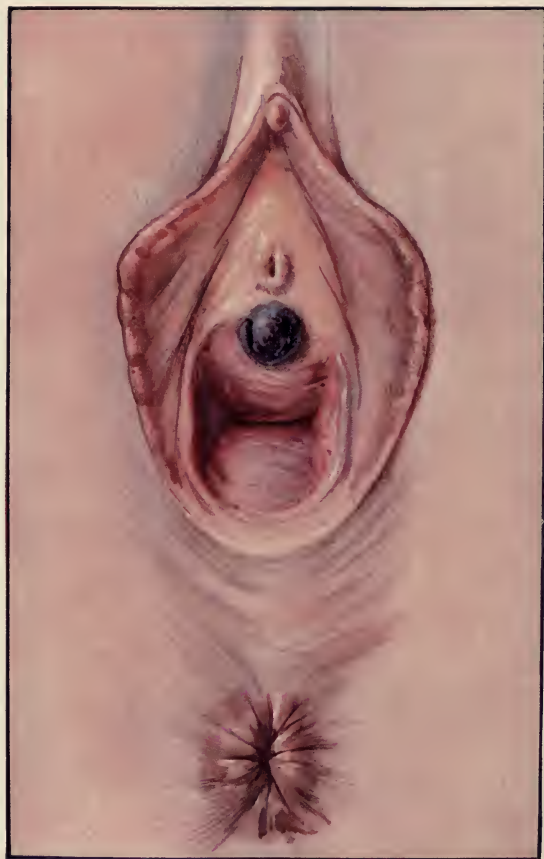
Secondary Sarcoma.—Sarcoma of the vagina secondary to disease in the uterus takes the form of hard purple nodules.

Melano-Sarcoma.—This is a very rare disease. It presents as a pedunculated tumour, bluish-black in colour, which soon ulcerates and becomes very offensive.

Chorion-Epithelioma.—Chorion-epithelioma of the vagina is a rare disease. It is usually secondary to a corresponding growth in the uterus but it may be primary in the vagina.

Primary Chorion-Epithelioma.—This disease most often follows the expulsion of a vesicular mole, but it also occurs after an abortion or a full-term pregnancy. Rarely the growth may appear before the mole has been extruded or evacuated as in the writer's case.

Symptoms.—In the early stages symptoms will be absent unless the growth



Primary Chorionepithelioma of the Anterior Vaginal Wall. (Author's Case).

happens to be touched when haemorrhage will result. Later the patient will complain of pain, haemorrhage, and an offensive discharge.

Signs.—The growth appears as a hard, purple nodule in the vaginal wall. It is sessile and resembles a thrombosed vein (see Plate II.). The growth easily breaks down on being touched, and very severe haemorrhage may result, so severe in fact that in a case that came under the writer's notice it was almost fatal. The growth may not appear for some months after the expulsion of the mole or birth of the child.

Pathology.—The tumour is composed of Langhans' cells and masses of syncytium.

Diagnosis.—In the writer's case the bleeding had been diagnosed as due to a miscarriage, and later, when the nodule was discovered, to rupture of a varicose vein. The fact, however, that the nodule bled so easily on being touched aroused suspicions of chorion-epithelioma, and on its being excised and microscoped this was found to be the case.

Prognosis.—Primary chorion-epithelioma of the vagina has disappeared spontaneously. It has also failed to recur after a limited excision of the vagina.

Secondary Chorion-Epithelioma.—The symptoms associated with the secondary form will be those of chorion-epithelioma of the uterus (see p. 577). The signs are similar to those described for the primary growth. The diagnosis of a secondary growth will be indicated by the detection of the uterine disease. The prognosis is very bad.

Treatment.—The correct treatment of primary chorion-epithelioma is to remove the uterus, since the trophoblastic cells therein were the original source of the vaginal growth. In addition the growth should be freely excised from the vagina. Recovery has been reported following excision of the vaginal growth only.

The treatment of the secondary form depends upon the presence or absence of other secondary growths. If the lungs, brain, liver, and spleen, the organs in which secondary growths are most commonly found, are free, the uterus and the implicated vagina should be freely removed.

Adeno-Carcinoma.—An adeno-carcinoma of the vagina has been described in which the tumour was bright red, irregular, and cauliflower-like in appearance. Its presence was associated with a purulent discharge and bleeding.

Most of the cases have arisen in the remains of Gartner's duct or in "wandered" cervical glands.

Primary Endothelioma.—A few cases of primary endothelioma of the vagina have been described.

Symptoms.—The patients complain of a slight discharge, and when ulceration occurs of some bleeding and pain.

Signs.—In Jellett's case¹ several raised infiltrated areas up to the size of a shilling were found on the anterior vaginal wall. The mucous membrane covering the areas eventually ulcerates and then bleeds easily on being touched.

Pathology.—The section showed masses of large epithelioid cells. In parts their arrangement showed considerable resemblance to gland-tissue, empty spaces being surrounded by tufted masses of cells resting on fibrous septa. In other parts the cells were arranged in masses resembling those found in squamous-celled cancer, but there was a clear space varying in size in nearly every group of cells. The clear spaces were dilated lymphatics surrounding proliferating masses of epithelium.

Treatment.—The whole of the vagina and the inguinal glands should be removed.

Adenomatosis Vaginae.—This condition was first described by Bonney and Glendinning.²

Cause.—Adenomatosis vaginae is thought to be due to a congenital peculiarity of the cells lining the vagina, in virtue of which they possess facultative gland-giving powers, similar to those covering the vaginal cervix in immediate proximity to the external os; and that this power lies dormant until actuated by an excitant, probably inflammatory and connected with child-bearing, the process being analogous to that by which a glandular erosion of the cervix is formed.

Symptoms.—In the case reported by Bonney and Glendinning the patient had suffered for some years from a continual vaginal discharge of a transparent sticky nature. It began insidiously, and had been increasing ever since. The continual discharge had produced soreness of the vulva and adjacent parts and necessitated the wearing of a diaper.

Signs.—The entire mucosal surface of the vagina and the vaginal surface of the cervix was of a singular red colour, and had a granular, finely honeycombed texture. It was studded all over with small cysts, varying from the size of a pin's head to that of a large pea, and from it poured a continuous stream of mucous fluid like the white of a hen's egg. The amount of discharge lost per diem was measured at six fluid ounces, the specific gravity of the fluid being 1014.

Pathology.—The vaginal surface of the pieces of mucous membrane removed exhibited a poorly stratified epithelium, reduced in many cases to the thickness of a single cubical cell. The tissue of the vaginal wall underlying it consisted of a fibro-muscular stroma in which the muscular elements were predominant, though ill-formed. Imbedded in this stroma and running throughout a large proportion of the thickness of the section were numerous glandular spaces. The glands were

¹ *Journ. of Obstet. and Gyn. of the Brit. Emp.*, 1907, p. 285.

² *Trans. of the Royal Soc. Med. (Obst. and Gyn. Sect.)*, vol. iv. No. 6.

everywhere lined by a single layer of tall columnar epithelium, entirely mucinogenetic as proved by their reaction to mucicarmine. They were small and most discrete immediately under the epithelium, being here separated from one another by considerable masses of the stroma, whilst deeper down they were exceedingly numerous and large, so that over considerable areas practically little interglandular connective tissue was seen. With increase in size their form became irregular, and some were converted into retention cysts. Here and there the communication of these glands with the surface could be demonstrated, the columnar cells lining the ducts of exit becoming continuous with the superficial squamous or short cubical epithelium. At these points all gradations between the two types of cells could be traced. The surface-epithelium at intervals showed small solid downgrowths, which here and there appeared to be excavating to form glandular crypts. The cellular elements of the interglandular stroma were chiefly ordinary connective-tissue cells with an oval or spindle-shaped nucleus. No plasma-cells could be demonstrated by Pappenheim's or by Bonney's staining methods, and very few lymphocytes and no polynuclear leucocytes were present. Weigert's stain revealed complete absence of elastic fibres under the surface-epithelium, but these were present in about normal proportion around the vessel-walls.

CONGENITAL AND ACQUIRED DEFECTS OF THE VAGINA

Congenital Defects.—Congenital defects of the vagina are considered in the article on Malformations (see Vol. I. p. 215).

Acquired Defects.—Acquired defects of the vagina may be due to atrophy, inflammation, or to misplacement.

Atrophy of the Vagina.—At the close of menstrual life, whether normal or induced by removal of the ovaries, the vagina commences to shrink, becoming smaller in all its dimensions, smooth and pale. This process gradually increases, till in old age its calibre may be so small that a digital examination is impossible. Associated with the decrease in size the walls of the vagina become smooth and thin, the vaginal orifice contracts, and senile vaginitis and kraurosis vulvae may supervene.

Treatment.—The atrophy of old age does not require any treatment. The decrease in size following the induced menopause may, if necessary, be remedied by a plastic operation or by the insertion, at suitable intervals, of a Sims' glass vaginal rest. Adhesions should be freely divided and a Sims' glass vaginal rest should then be inserted and worn for several hours a day, the size of the rest being gradually increased until full dilatation is accomplished.

Inflammation.—It occasionally happens that the vagina is injured by child-birth, by operative procedures, by the presence of foreign bodies, by the temperature of a douche being too high or the chemical it contains too strong, or by criminal assault. The wound becoming infected inflammation results, and the inflamed surfaces may become adherent. Adhesions may also be due to other causes of vaginitis or to the local effects of radium. The size of the vagina may be markedly diminished by the contraction of the scar-tissue in the neighbourhood of a vaginal fistula.

Misplacement of the Vagina.—The vaginal walls may be partly prolapsed as in cystocele, rectocele, or enterocele, or totally prolapsed in procidentia of the uterus. These conditions are described in the Article on Prolapse (see p. 627).

INJURIES TO THE VAGINA

The vagina may be injured by the pressure of foreign bodies therein, by laceration during child-birth or coitus, by attempts at criminal abortion, and by assault. The most common complication following injuries to the vagina is a fistula between the bladder, rectum, urethra, or ureter.

Injuries due to Foreign Bodies.—The commonest foreign body to injure the vagina is a pessary which has not been attended to properly, or which is too large. A pessary should never be worn for more than three months without being removed and cleaned. During the time it is *in situ* the vagina should be douched daily with some mild antiseptic solution such as boric acid, ʒi to Oi. The neglect of these simple precautions will lead to the uterine and vaginal discharges accumulating round the pessary with a resulting inflammation and perhaps ulceration. Under such circumstances pessaries have ulcerated into the bladder and caused cystitis. Recto-vaginal fistulae may also be caused in a similar way. Further, if the pessary is too large and its presence is tolerated it may by its pressure ulcerate into the bladder or rectum.

Foreign bodies, other than pessaries, may be introduced into the vagina by children in ignorance, by females of child-bearing age to prevent conception, by idiots, by women to cheat the customs, to prevent their money or jewels being stolen, or to safeguard money or jewels which they have stolen. Lastly, as the result of assault, foreign bodies may be forced into the vagina.

Bland-Sutton and Giles¹ give the following comprehensive list of articles that have been removed from the vagina: "Hairpins, pebbles, fruit stones, pencils, sponges, cotton-wool, pomade-pots, pewter-pots, cotton-reels or spools, candle-

¹ *Diseases of Women*, Bland-Sutton and Giles, 6th ed. p. 14.

extinguishers, india-rubber balls, pipe-bowls, thimbles, clock-weights, pieces of metal, gems, bank-notes, jewellery, pocket-books, a piece of brick, a rose-bud, cylinders of inverted pork-rind, a cork, thimble, rag, needle-case, boot-lace, and a small bust of Napoleon the Great."

Treatment.—If inflammation has been set up by a pessary it must be removed and mild antiseptic vaginal douches ordered. In some cases, where the pessary has ulcerated into the bladder and its end has become coated with phosphates, great difficulty has been experienced in its removal, necessitating at times the use of a lithotrite.

Other foreign bodies should of course be at once removed and appropriate douches prescribed. As carcinoma has followed on such ulceration, if the tissue surrounding the ulcer is markedly indurated and bleeds easily on palpation, a portion of it should be excised for microscopical examination.

Injuries due to Child-birth.—The vaginal walls may be lacerated during child-birth, the laceration extending into the bladder, rectum, broad ligaments, or peritoneal cavity. For a description of such injuries and their treatment the reader is referred to a work on Obstetrics.

Injuries due to Coitus.—The vagina may be lacerated during coitus, usually as the result of rape or from disproportion in size between the penis and vagina, and very rarely it may be perforated by the forcible and direct impact of the penis as in a case reported by Bonney.¹

Lacerations do not commonly involve the peritoneum, and the lower end of the vagina being the narrower is the part most likely to be lacerated. The tear is usually situated on the posterior or lateral walls and involves the paravaginal cellular tissue. Exceptionally it may penetrate into the peritoneal cavity. In cases of perforation the injury is situated in the posterior fornix.

The most serious and even fatal injuries of the vagina have resulted from rape on young children, comprising deep lacerations of the posterior wall involving the rectum. Gangrene of the vagina has resulted from such injuries. The whole vagina has been torn from its attachment to the cervix, and the peritoneal cavity has been opened.

Injuries due to Attempts at Criminal Abortion.—Criminal abortion is sometimes accomplished by the woman herself passing a piece of stick or knitting needle up the vagina through the cervical canal into the uterus. At times the object passed into the vagina does not enter the uterus, and force being employed the vagina is injured and in some cases has been perforated.

Gangrene of the vagina and fatal peritonitis have followed such injuries.

¹ *Arch. Middlesex Hospital*, vol. xxviii., December 1913.

Injuries due to assault, self-inflicted, and spontaneous.—The vagina may be injured by the forcible introduction into it of some foreign body during a drunken brawl. Fatal peritonitis has resulted from such injuries.

A woman has ruptured her vagina in an endeavour to replace it after it had prolapsed.

Spontaneous rupture of the vagina has resulted from a sudden prolapse of that organ due to the exertion of carrying a heavy weight.

Treatment.—The treatment of injuries to the vagina is carried out on ordinary surgical principles.

DISEASES OF THE UTERUS

CHRONIC ENDOMETRITIS

CERVICAL EROSION

CHRONIC METRITIS

MORBID INVOLUTION

CERVICAL LACERATIONS

MYOMA

ADENOMYOMA

SARCOMA

CARCINOMA

CHORIONEPITHELIOMA

BACKWARD DISPLACEMENT

CHRONIC INVERSION

PROLAPSE

CHRONIC ENDOMETRITIS

By Professor B. P. WATSON
(Toronto)

Introduction.—When the term ‘Endometritis’ was introduced into gynaecological literature ideas of pathology were not so clearly defined as they are now. It came to be a convenient term, used to designate a supposed inflammatory condition of stroma and glands, giving rise to a great number and variety of symptoms, which were associated with more or less enlargement of the uterus. The symptom-group comprised menorrhagia and dysmenorrhoea, leucorrhoea, sterility, tendency to abortion, pain in the back, and general debility. The presence of all or of any combination of those symptoms, without other physical sign than slight enlargement of the uterus, was held as sufficient evidence on which to base a diagnosis of endometritis. Hence arose a symptomatic classification into haemorrhagic, catarrhal, and dysmenorrhoeic varieties. Later anatomical and microscopical research revealed different appearances in the endometrium in cases presenting the same clinical picture, and there arose an anatomical classification into interstitial and glandular endometritis (Ruge and Veit) according to the tissue in the endometrium supposed to be affected. More critical examination of the microscopic appearances presented, showed that many of them were not of an inflammatory nature, and that, whilst some were pathological, others were simply physiological variations dependent upon normal menstrual function, or upon the normal retrogressive changes which the uterus undergoes in later sexual life. The result of this work has been to restrict greatly the term ‘Endometritis,’ and to ascribe to other causes many of the symptoms hitherto supposed to be due to it, and to find some other explanation for the pathological appearances presented under the microscope. The position I take on this subject is in agreement with that of Hitschmann and Adler¹ and others, who

¹ “Die Lehre von der Endometritis,” *Wiener med. Wochenschr.*, 1907, lvii. 1297; *Berlin. klin. Wochenschr.*, 1908, xlv. 715; *Berl. klin. Wochenschr.*, 1909, No. 41, p. 1869; *Arch. für Gyn.*, 1913, Band c. 233.

hold that the only true endometritis is that of the interstitial type ; that so-called 'glandular endometritis' does not exist, but that most of the appearances, hitherto described as such, are merely physiological changes in the glands occurring in the course of the normal menstrual cycle, and that when glandular hyperplasia is definitely present it is more of the nature of a new growth than of an inflammation.

For convenience of description, glandular hyperplasia is dealt with in the present chapter, but it will be made clear that it is not of inflammatory origin, and that it cannot in itself be held responsible for many of the symptoms hitherto ascribed to it. The whole subject is still a matter of controversy, and agreement will not be reached until we understand more about the physiological conditions influencing the uterine mucous membrane. In the following pages an attempt is made to treat the subject in the light of that knowledge which we now possess. This involves the shattering of what has hitherto been regarded as a definite clinical picture, but it undoubtedly tends to a more careful analysis of symptoms in relation to physical signs and pathological findings, and will ultimately lead to more rational and therefore more effective methods of treatment.

CHRONIC INTERSTITIAL ENDOMETRITIS

According to strict pathological standards this is the only form of chronic inflammation in the endometrium. As the term implies, the lesion is limited to the interstitial tissue or stroma. In its etiology, symptomatology, and pathological anatomy it does not differ essentially from inflammation in other tissues.

Etiology.—It may follow an acute inflammatory condition of the uterus, due to any of the ordinary infective organisms (see *Acute Inflammation of the Uterus*, Vol. I. p. 528). The consensus of opinion among writers on the subject is that the *gonococcus* is most often responsible, and after it the *streptococcus*. The latter is usually implanted in the uterus *post partum* or *post abortum*. More rarely some form of *staphylococcus*, or one or other of the *saprophytic organisms*, is the infective agent. In many instances no history of a preceding acute infective lesion can be obtained, more especially in gonorrhoeal cases. In such the inflammation has been subacute or chronic from the beginning. It has long been known that the gonococcus may remain for a long time in the genital tract in a state of attenuated virulence, and, more recently, the same thing has been demonstrated in the case of the various streptococci.

Pathological Anatomy.—The lesion may be confined entirely to the mucous membrane of the uterus, but more frequently it is associated with cervical inflammation, and there may be extension to the uterine wall and uterine adnexa. The

uterine mucous membrane is swollen, sometimes to a thickness of 4 or 5 mm., and the surface is covered with a muco-purulent discharge. On microscopic examination there may, or may not, be marked oedema and exudation into the stroma. Oedema is not of much significance, as it varies according to the time of the menstrual cycle at which the scrapings are obtained. Oedema, formerly thought to be of inflammatory origin, is in many instances that normally present in the mucous membrane before menstruation. The only definite evidence of chronic inflammation is the presence of accumulations of round cells and the occurrence of plasma-cells. In well-marked cases of endometritis there is diffuse or patchy infiltration by round cells in the interglandular tissue, and there may be accumulations of them around and in the lumina of the glands.¹ In the subacute stage polymorphonuclear leucocytes may also be present, especially in gonorrhoeal cases. The significance of the presence of plasma-cells is disputed. Hitschmann and Adler attached considerable importance to them in making a diagnosis of endometritis, but have somewhat modified their earlier statements in their latest communication.² Henkel,³ Theilhaber and Meier, Fothergill⁴ and Schickele and Keller⁵ believe that their significance has been much over-estimated. The last-mentioned authors hold that in some cases, in which the histological picture and the history indicate inflammation, plasma-cells are absent, whilst in many cases of displacement of the uterus, without signs of inflammation, they may be present. Büttner⁶ and Schwab⁷ point out that they often disappear soon after the development of the inflammatory process. Büttner demonstrated their presence in 58 out of 189 cases of curettage, and found that they tend to increase with age, attaining their maximum in the second half of sexual maturity, and then diminishing towards the menopause. While, therefore, round-cell accumulation, together with the presence of plasma-cells, is an almost certain criterion of inflammation, the absence of the latter should not exclude this diagnosis. It must be remembered that, normally, small lymph-nodes are present in the endometrium. I have seen several specimens containing them, and in none was there evidence of inflammation.

In addition to stroma-changes there are usually present vascular dilatation and the formation of new vessels, often in groups.

As sequelae of these changes we should expect, judging from analogy in other tissues, a progressive fibrosis and thickening of vessel-walls, and this undoubtedly

¹ Theilhaber and Meier, *Berlin. klin. Wochenschr.*, 1907, vol. xlv. 1496; *Arch. für Gyn.*, 1908, Band lxxxvi. 628.

² *Arch. f. Gyn.*, 1913, Bd. c.

⁴ *Brit. Med. Journ.*, 1911, vol. i. 559.

⁶ *Arch. für Gyn.*, 1910, xcii. 781.

³ *Berlin. klin. Wochenschr.*, 1909, Bd. xlv. 1187.

⁵ *Arch. f. Gyn.*, 1911-12, Bd. xc. 586.

⁷ *Zentralbl. für Gyn.*, 1907, No. 29.

occurs (see "Chronic Metritis," p. 117). A number of cases hitherto described as fibrosis of chronic inflammatory origin are, however, merely instances of physiological atrophy. In some cases cure may occur without any permanent histological change in the tissue.

The possible effect of chronic inflammatory lesions of the stroma on the uterine glands has been a subject of great controversy in the past, and cannot yet be said to be definitely settled. Most of the recent investigators, however, agree that glandular changes of any marked degree seldom result, and with this opinion I am in accord. It will be pointed out when we come to deal with so-called glandular hyperplasia that there is usually no evidence of an inflammatory origin. Further, in definite cases of interstitial inflammation hyperplasia of the glandular elements is not more common than in cases with no demonstrable inflammatory reaction. From analogy in other organs, such as the liver, the Fallopian tube, and even the cervix, epithelial proliferation, as the result of a chronic inflammatory process, would be expected. Its absence in the uterine mucosa emphasizes the fact that it is a tissue apart, and that, in interpreting appearances in it, we must be careful not to generalize too much from conditions found in other organs.

In gonorrhoeal endometritis, the most common form, glandular hyperplasia is not at all common. If we take the presence of plasma-cells as a criterion of inflammation, Büttner points out that in only 22·4 per cent of scrapings, in which they are present, is glandular hypertrophy demonstrable, whilst in cases in which plasma-cells are absent hypertrophy is present in 17·6 per cent. The difference is so small that the conclusion must be that inflammation is not a cause of glandular hypertrophy or hyperplasia. In definite inflammatory lesions of the uterus and tubes, such as pyosalpinx, where an opportunity is given to examine the mucosa after removal of the organs, glandular hypertrophy in the endometrium is not more frequently met with than in the apparently normal organ. These facts would seem sufficient to exclude a 'glandular endometritis' from our terminology. The only effect which interstitial endometritis may have on the glands is compression by the exudate or by cicatricial formation. This may result in some modification of normal menstrual changes, either in the direction of restraining pre-menstrual proliferation, or interfering with post-menstrual involution. It may also in some instances lead to dilatation and cyst-formation, although this is more frequently seen in the otherwise normal senile endometrium than in one definitely the seat of a previous inflammation (Fig. 54).

The condition commonly known as *membranous dysmenorrhoea*, in which the superficial part of the uterine mucosa is expelled during menstruation with severe pain, has hitherto generally been regarded as of inflammatory origin. This opinion

was based on the presence of round cells and of more or less necrosis. Hitschmann and Adler, in an examination of 12 cases, never found plasma-cells. This, together with the known occurrence of round-celled infiltration in the normal menstruating mucosa, leads them to conclude that the condition is not of inflammatory origin, but results from an abnormal type of menstruation. Ascheim,¹ in an examination of 7 cases, was never able to isolate organisms. The condition is met with in cases of fibromyoma, chronic metritis, stenosis of the cervix, and pelvic inflammation. In menstruation there is a differentiation of the mucosa into compact and spongoid portions, very like that which occurs in pregnancy. In membranous dysmenorrhoea the surface portion is thrown off as a more or less complete layer. This probably results from abnormal density of this layer, which prevents the percolation of blood through it, or to an excessive amount of haemorrhage in the deeper parts. The expulsion of the membrane is accompanied by severe pain, and there is usually an excessive loss of blood.

To sum up, interstitial endometritis is a condition arising *post partum*, or from gonorrhoea, or other implanted infection, and resulting in an exudate of round cells and pus-cells in the stroma, associated in the early stages with plasma-cells. There is vascular dilatation, and later a tendency to thickening of vessel-walls and fibrosis of the stroma. Glandular hypertrophy and hyperplasia practically never result.

Symptoms and Physical Signs.—The one characteristic symptom of interstitial endometritis is leucorrhoeal discharge. A certain amount of leucorrhoea is normal before and immediately after menstruation. This is of thin consistence and clear in colour, and consists of mucus, isolated leucocytes, pavement-epithelium, and numerous bacteria. It is a mixture of secretion from the uterine and cervical mucosa, together with vaginal epithelium and bacilli. When an inflammatory condition, with exudate, is present in the interstitial tissue, the leucorrhoeal discharge becomes muco-purulent or purulent, and contains numerous round and pus-cells. In the chronic stage the pathogenic organism is seldom isolated, except in gonorrhoeal infections with an associated endocervicitis. If the cervix is exposed by the speculum and all discharge carefully removed from the cervical canal and vaginal portion of the cervix, the presence of an interstitial endometritis may be inferred from the escape of a muco-purulent or purulent discharge from the uterus. Menorrhagia is sometimes present, and so also is dysmenorrhoea. Both of these symptoms are probably due to involvement of the muscular wall, the peritoneum, or the uterine adnexa. Pain in the back, and a feeling of weight and fulness in the pelvis, which are often present, are likewise probably due to lesions outside the mucous membrane.

¹ *Arch. für Gyn.* Bd. lxxx. H. 2.

On bi-manual examination the uterus is often enlarged, sometimes flaccid, but at other times harder in consistence than normal, and it may be tender. Diagnosis must rest upon the demonstration of the pathological uterine secretion.

Prognosis.—The condition is very chronic, especially when due to gonorrhoea, and may persist for years. At any time there may be acute exacerbations, with involvement of the uterine wall or Fallopian tubes. This is especially apt to occur after abortion or full-time labour, and is the explanation of some cases of puerperal septicaemia. As a rule the patient is sterile, and if pregnancy does occur abortion is frequent, as the decidua is unhealthy. It contains many round cells, tends to be soft and congested, and bleeds readily. To the condition the name decidual endometritis is given.

Treatment.—The object of treatment in chronic interstitial endometritis is to eradicate the infecting organism, if such be still present, and to promote the growth of a healthy endometrium to replace the one containing inflammatory exudate. These objects are difficult of attainment, and so far no absolutely satisfactory method has been devised. It has long been recognized that cervical infections, especially gonorrhoeal, are very difficult to cure. Similar lesions in the endometrium are still more refractory to treatment. The method most generally employed, and that which gives the most satisfactory results, is the intra-uterine application of some caustic or germicide. Curettage, as a preliminary to this application, is of value in some cases. It has been extensively employed on the assumption that after it a new and healthy mucous membrane would form. This, however, does not usually occur. In recent infections any benefit which may accrue is scarcely balanced by the risk of causing more deeply-seated inflammation. It is not infrequent to find that leucorrhoea is actually more profuse after curettage.

A variety of drugs may be used in making intra-uterine applications. Those which have given the best results are such as are strongly germicidal, but have not too great caustic effect. Formalin, in its ordinary commercial strength of 40 per cent, has given good results. In gonorrhoeal cases nitrate of silver (5 to 10 per cent), argyrol (30 to 40 per cent), or albargin (3 per cent) may be used. Chloride of zinc in a 30 per cent solution may also be employed, but care must be taken lest it produce deep sloughing, with subsequent cicatrization of the cervical canal. Such topical applications give better results than intra-uterine irrigation, and are less risky than the injection of substances into the uterine cavity.

In making the application a probe dressed with cotton wool should be used. The cervix is exposed with the bivalve or Sims' speculum, and steadied with a tenaculum. It should not be forcibly pulled down. Any secretion clinging to the vaginal

portion and in the cervical canal is removed with cotton wool soaked in a solution of bicarbonate of soda. If the mucus is very tenacious it can be loosened and easily removed by allowing such a pledget to remain in contact with the cervix for a few minutes. As a preliminary, a sterile sound is introduced to determine the patency of the canal and the direction of the uterine axis. In some cases it may be necessary to dilate the cervix with one or two of the finer graduated dilators, and in such it may be necessary to give an anaesthetic. The dressed probe is then introduced, and left in for one or two minutes. After the application, a tampon saturated with a 10 per cent solution of ichthyol and glycerin should be introduced below the external os. This prevents the drug employed from flowing down on to the vaginal walls and vulva. It may be removed by the patient herself on the following day. The treatment should not be repeated oftener than once in five or six days, and in the intervals between treatments mild antiseptic vaginal douches, such as 1 in 5000 bichloride of mercury solution, should be used. If there is a tendency for pus to accumulate in the uterine cavity repeated slight dilatation of the cervix may be required.

General therapeutic measures should also be employed. As we have seen, it is rare to have a chronic endometritis uncomplicated by other lesions in the uterine wall or appendages. Absolute rest in bed is not required, but any excessive exertion ought to be avoided. Long-continued standing tends to aggravate the condition by favouring pelvic congestion. The bowels should be carefully regulated, and all irritating articles of food and drink, and especially alcohol, forbidden. An iron tonic is frequently indicated. If the uterus is displaced and freely movable the displacement ought to be rectified and a pessary worn, if this can be done without pain. The pelvic circulation is stimulated by hot vaginal douching, and the glycerin and ichthyol tampon which is employed tends to deplete the tissues. Scarification of the cervix used to be employed with the same object, but is now seldom used. The application of steam to the interior of the uterus was a method advocated by Pincus. It is now seldom used, but heated air is still employed by some. For its application a special apparatus is required. Various devices for the induction of Bier's passive hyperaemia in the cervix and uterus have from time to time been devised, and good results have been reported from them.¹ They have never been extensively employed in this country, and I have no experience of them.

GLANDULAR HYPERTROPHY AND HYPERPLASIA

As opinion is not yet unanimous regarding the aetiological relationship between inflammation and glandular hypertrophy and hyperplasia, it has been thought right

¹ This will be found described in the Article on Therapeutics (Vol. III. p. 779).—EDITORS.

to discuss the latter in the present article. It will be gathered from the preceding pages that I agree with Hitschmann and Adler, Theilhaber, Meier, and others that while glandular hypertrophy and hyperplasia are sometimes associated with a definite inflammatory lesion, they are not caused by it. Further, it must be remembered that a great many conditions formerly regarded as pathological hyperplasias must, in the light of recent research, be considered merely as phases in the normal menstrual cycle. In order adequately to appreciate the significance of the glandular picture

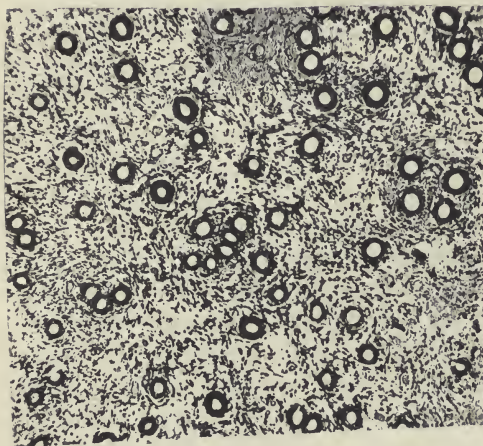


FIG. 46.—Normal uterine mucous membrane removed by curette two weeks after menstruation. The glands are narrow, circular in outline, and widely separated. (Low power.)

it will therefore be necessary briefly to outline the changes normally occurring in the glands throughout this cycle.

In the normal uterine mucosa the glands are simple tubular structures, running more or less obliquely to the surface, and penetrating sometimes as deeply as the superficial muscular layer. They are lined by a single layer of columnar epithelium set upon a basement membrane. Their number, and the closeness with which they are set in the stroma, vary with the age of the patient. They are scanty and widely separated in the child, more numerous and closely set during active sexual life, and again fewer in number after the menopause. At all ages there are wide individual variations, so that it is difficult or impossible to fix a definite physiological standard. As a working basis the membrane may be regarded as normal when the glands are from four to five times their own diameter from one another, when they are fairly wide and straight, or only slightly tortuous (Figs. 46 and 47). Deviations from this standard occur during certain phases of the menstrual cycle, and are therefore physiological, and are also present in pathological hypertrophy and hyperplasia. By hypertrophy is meant a condition of dilatation or tortuousness of the glands. Hyperplasia is an increase in their number, often associated with excessive proliferation of the lining cells.

Glandular Changes in the Menstrual Cycle.—Changes in the stroma of the endometrium in connection with menstruation have long monopolized attention.

That the glands also undergo definite modifications at different periods of the cycle has been clearly demonstrated by Hitschmann and Adler. Their work has been confirmed by Theilhaber and Meier, and Hartje,¹ working independently, and has been very generally accepted, with slight modifications.

The uterine mucous membrane is never at rest, and the microscopic appearances differ widely at different stages in the menstrual cycle. For descriptive purposes this cycle may be divided into four phases : pre-menstrual, menstrual, post-menstrual, and interval.

The *pre-menstrual* phase begins about the seventh day prior to menstruation,

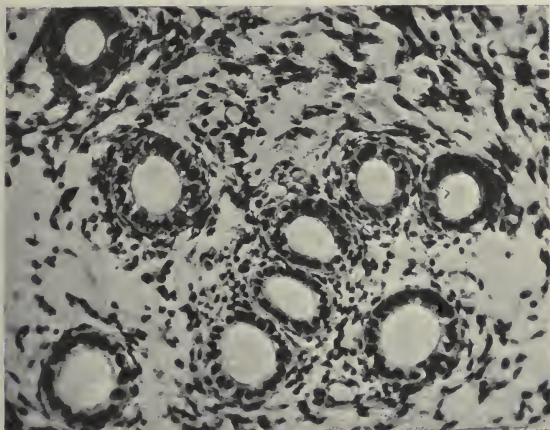


FIG. 47.—Higher-power view of section shown in preceding figure. Note the circular outline of the glands; the low columnar gland-epithelium with central nucleus; the absence of secretion in the lumina.

and lasts until the beginning of the flow. It is characterized by hypertrophy of the glands, resulting in dilatation. Epithelial buds and papillary processes project into the lumina, giving the glands a saw-like appearance on section. The enlarged glands are closer together, and may be almost back to back, so that the intervening stroma appears to be diminished (see Fig. 52). Sometimes there are invaginations into the lumen, giving an appearance of a gland within a gland on section (Fig. 48). The cells are enlarged and swollen, and their free margins no longer form a definite line limiting the lumen, but present a ragged appearance (Figs. 49 and 50). This is due to the establishment of their secretory function. At this stage a mucicarmine positive substance is present in the cells and in the lumina. The

¹ *Monats. für Geburts. und Gyn.* Bd. xxvi. ; *Zentralbl. für Gyn.*, 1907, p. 1465.

number and size of the papillary projections and epithelial tufts vary in different cases, as also does the degree of dilatation and tortuosity (Figs. 51 and 52). In normally menstruating mucous membranes the general appearances are, however, very constant.

With the *onset of menstruation* the gland-cells collapse, discharging their contents

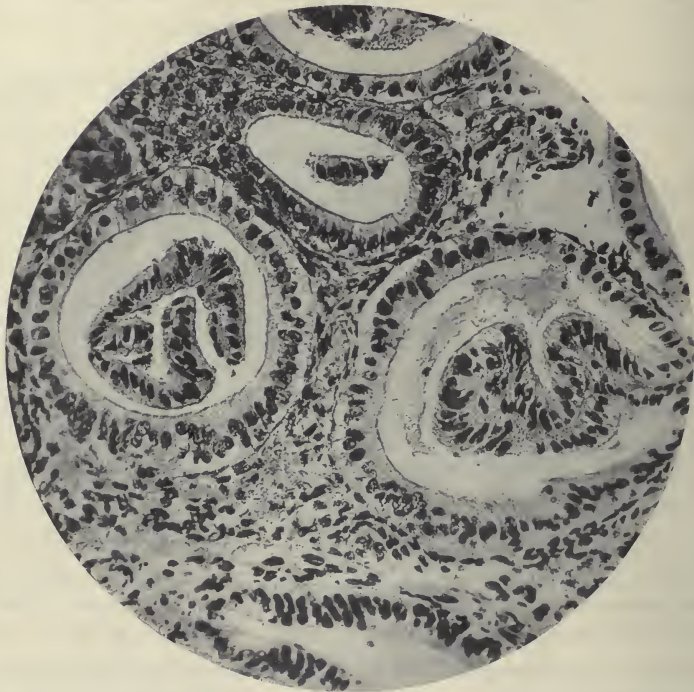
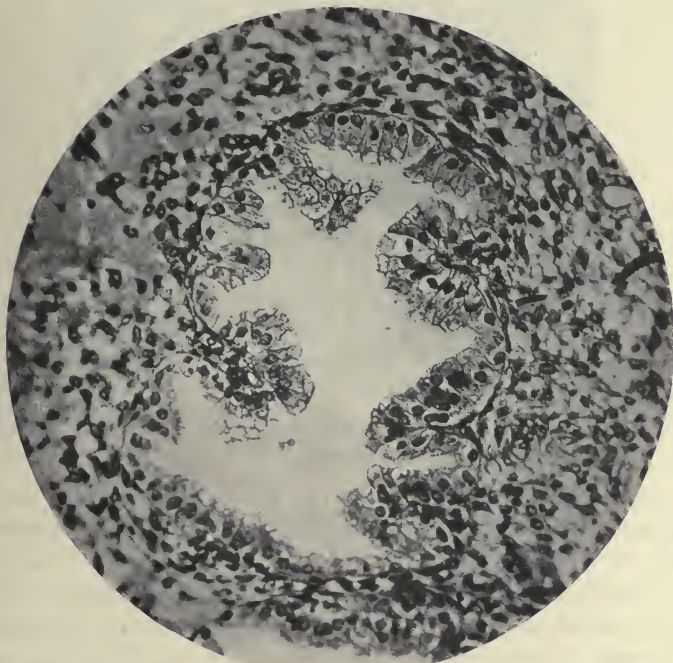
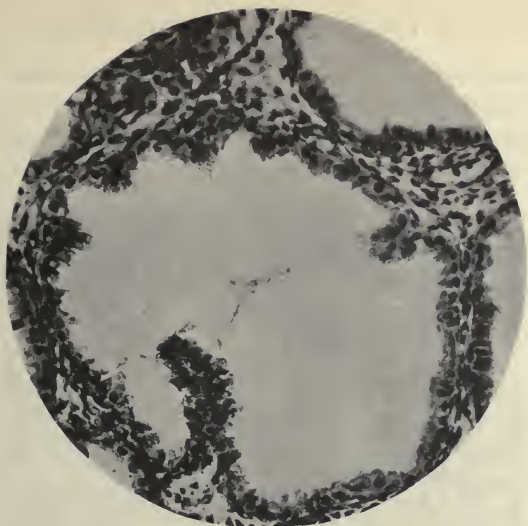


FIG. 48.—Section of uterine mucous membrane removed by curette during the post-menstrual phase, showing the appearance of glands within glands. At the right of the figure note that this appearance is due to infolding of the collapsed gland wall. (High power.)

into the lumen, and thence it escapes into the uterine cavity. The gland-lumen as a result contracts, and the gland becomes less tortuous. Individual cells undergo destruction, and are represented by fragments of nuclei lying between the other cells. This cellular degeneration may be evident immediately before menstruation.

In the *post-menstrual* phase the gland-lumina are narrow and widely separated, the cells small, with their free margins forming a regular line, and there is no mucicarmine positive substance present (Fig. 47).



FIGS. 49 and 50.—Uterine glands from mucous membrane removed by curette two days before expected menstruation. Note the irregular contour, the papillary projections, the irregularity of the free margins of the cells, the height of the latter, and the depth of the nuclei. (High power.)

In the early *interval* mitoses begin to appear in the gland-cells, and the glands become slightly dilated. In the middle interval mitoses are more numerous, the glands are dilated and tortuous, and secretion is present in the cells. In the late interval signs of secretion are prominent, the lumina are widely dilated, and mitoses



FIG. 51.—Uterine mucous membrane in pre-menstrual phase, showing appearances formerly described as 'Glandular Endometritis.' Note the closeness of the glands, their dilatation, irregular contour, the inward projection of the gland-epithelium, and the presence of secretion. (Low power.)

are more scanty. This leads on to the pre-menstrual phase, with the tuft-like and papillary arrangement of the epithelium, and the filling of the lumina with secretion.

These various phases merge gradually into one another without definite demarcation, and probably there is no period of complete rest. In the normal case, however, it is usually possible to determine approximately the phase during which the mucosa has been removed.

In interpreting the appearances presented under the microscope it is therefore necessary to take account of the time in relation to menstruation at which the mucosa was obtained, so that we may not class as pathological a condition which may well be within physiological limits. In judging of this it is necessary to know the constancy

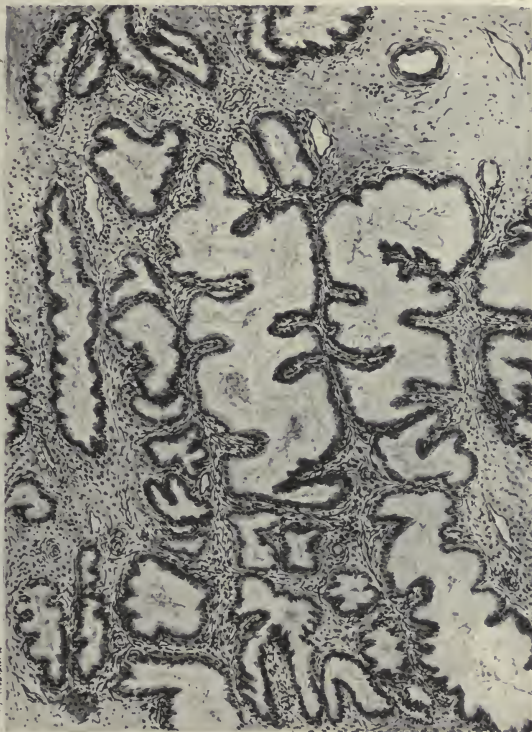


FIG. 52.—Uterine mucous membrane removed by curette three days before expected menstruation. Note the tortuosity and dilatation of the glands, the papillary projections into the lumina, and the presence of secretion. (Low power.)

of occurrence of those various phases, and at present the want of an exact knowledge on this point is the greatest difficulty in interpreting the microscopic picture. It would appear that the more closely these glandular hyperplasias are studied in relation to the menstrual cycle, the greater become the number of cases which can be classed as physiological. The dilated and tortuous glands, with saw-like papillae and epithelial tufts in the interior, often almost back to back, with little intervening stroma, are typical of the normal pre-menstrual phase, and reproduce exactly the

picture of what has hitherto been termed hypertrophic and hyperplastic glandular endometritis.

But when all this is granted, there yet remain a certain number of cases of glandular hypertrophy and hyperplasia which cannot be explained on a normal menstrual basis. To a consideration of these attention will now be directed.

In the first place it is sometimes found, in uterine scrapings removed after



FIG. 53.—Uterine mucous membrane removed ten days after menstruation from a patient in whom menstruation was very irregular. Different glands exhibit different states of activity.

menstruation, that all or many of the glands present appearances characteristic of the pre-menstrual phase, that is they are in a condition of hypertrophy and hyperplasia, when we would expect them to be small and collapsed. According to Hitschmann and Adler, those appearances are in most instances to be explained by retardation of the normal involution process, or more frequently by irregularity of menstruation. This latter results from irregularity in the ovarian function which controls it. Any variation in ovarian function will express itself in variation in the alternation of the phases of the uterine mucosa. In cases of regular, but long-protracted, menstruation it is not uncommon to find a hyperplastic condition of the glands when curetting is done towards the end or after the cessation of the flow. This may be explained by supposing that the stimulus which leads to

the increased duration of menstruation interferes with the normal involution of the glands. Many of the glands in such cases are in a condition of partial involution. They are collapsed, the lumina are narrow, and they are often tortuous, so that they are apt to be confused with the appearances presented by an active pre-menstrual hyperplasia. When menstruation is irregular, the regularity of the cyclical changes in the mucosa is lost. Definite stages do not follow each other symmetrically, and all stages of glandular development may be present in one microscopical preparation (Fig. 53). Such appearances should not be interpreted as primarily pathological, but as an expression of derangement of the influences—chiefly ovarian

—which control menstruation. In other words, the pathological condition of the mucosa is not the cause of the irregular menstruation, but both are dependent on a common cause. As we shall see later, glandular changes in the mucosa have little or no influence on menstruation, or in causing menorrhagia, which is just what would be expected if the foregoing facts are correct. It would appear that the only influence modifying the alternation of phases, with their typical glandular

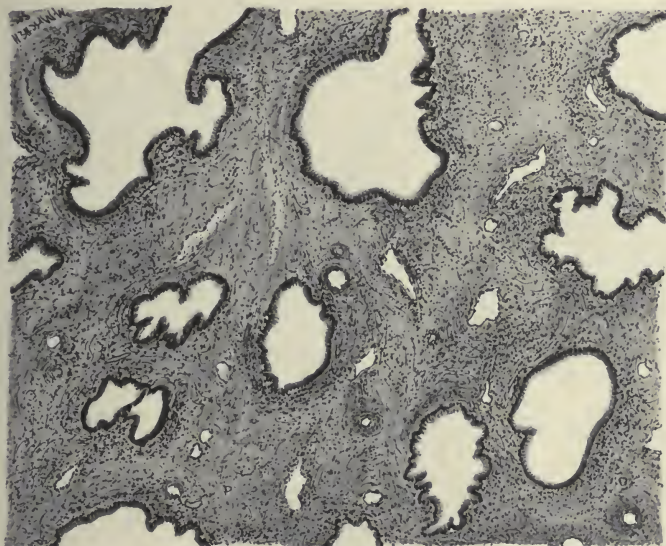


FIG. 54.—Mucous membrane from a patient forty-three years of age. The stroma is fibrous, and some of the glands are widely dilated. (Low power.)

pictures, is ovarian. There is no evidence that inflammation or local irritation, as by tumour growth, has any effect upon it.

Apart from those cases of irregular menstruation in which there is a mixing of the phases of glandular development, there are appearances observed in some uterine mucous membranes which must be regarded as more or less pathological. The mucosa for instance may show the proper phase-picture, but with an exaggerated hyperplasia, either in the form of group-formation of glands or of invaginations. Invagination of the walls of the glands, giving rise to an appearance on section as in Fig. 48, is generally regarded as pathological. It is doubtful, however, if it is of much clinical significance. Its production may be due to relaxation after maximum dilatation of the glands. These invaginations are more often seen in mucous membrane removed

by the curette than in specimens cut along with the uterine wall. Schröder¹ found them in 77 out of 91 curettings, and only in 1 out of 29 extirpated uteri. This points to the condition being in many cases an artefact.

Another condition which can only be regarded as abnormal is marked cystic dilatation of the glands (Fig. 54). This is often seen in the mucosa of women



FIG. 55.—Mucous membrane and part of muscular wall of uterus containing an interstitial fibroid tumour. The mucosa is thick and some of the glands are dilated, but there is no marked hypertrophy or hyperplasia. The patient suffered from severe menorrhagia. (Low power.)²

approaching and past the menopause. It is not infrequent in the case of fibroid tumours of the uterus (Fig. 55), and may be met with in an otherwise normal mucous membrane. In some cases it appears to be due to an obstruction of the gland-mouth; but in others is evidently not mechanical, for the lining-cells are not compressed, but apparently in active growth. It is of no clinical significance so far as symptomatology is concerned.

¹ *Arch. für Gyn.*, 1912, Bd. xeviii. p. 81; and lxxxviii. p. 1.

² For the naked-eye appearances of this condition, see Fig. 71, p. 146.—EDDINGS.

There is another condition which Albrecht¹ has termed "stationary hyperplasia." In this the mucous membrane undergoes no change of phase. The glands are increased in number, and may be back to back. The lumina are wide and usually empty. There may be tuft-like projections of the epithelium into the cavity, but there is no evidence of secretion. The whole appearance suggests an adenomatous proliferation.

In glandular cystic hypertrophy, often termed *villous endometritis* or *endo-*



FIG. 56.—Uterus showing 'glandular cystic hypertrophy' of the mucous membrane. Hysterectomy performed on account of intractable haemorrhage persisting after curettage. Note the cystic character of the ovary and the tubo-ovarian adhesions.

metritis fungosa, the mucous membrane of the uterus is greatly thickened, and thrown into cushion-like folds and papillary projections. The whole area of the mucous membrane of the body of the uterus is affected, giving rise to an appearance very like that of cancer of the body (Fig. 56). Microscopic examination shows an increase in all the constituents (Fig. 57). The glands do not pass through the regular cyclical transformation, but usually present an appearance corresponding to the post-menstrual phase, and there may be a considerable amount of cystic dilatation. Plasma-cells or other signs of inflammation are usually absent. It is

¹ Berlin, *klin. Wochenschr.*, 1911, Bd. xlix. 1000.

most commonly met with at or near the menopause, but sometimes in young women. Of 18 cases described by Büttner, 4 were in the fifth decade, 2 were seventeen years old, 3 were between twenty-two and twenty-four, and 2 were in the fourth decade. According to Büttner, it is due to abnormal ovarian function of the same nature as,

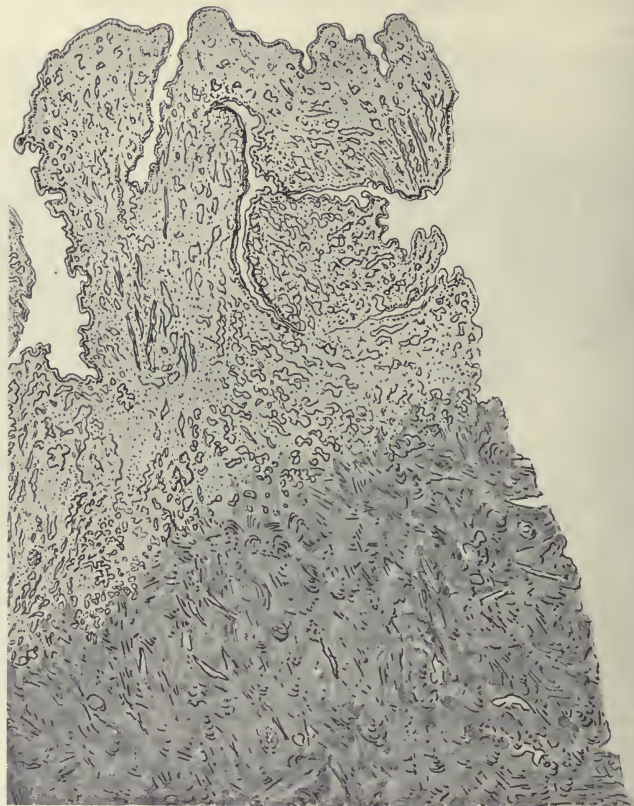


FIG. 57.—Section of mucous membrane from uterus shown in preceding figure. It is thicker than normal, but there is no marked glandular hypertrophy or hyperplasia. (Low power.)

but of more marked degree than, that giving rise to irregular menstruation and displacement of phases. It is usually associated with severe menorrhagia, but there is no evidence that this is directly attributable to the condition of the mucous membrane. That there is deranged ovarian function is evidenced by the fact that long periods of amenorrhoea may alternate with severe haemorrhages, as in the patient

from whom the uterus shown in Fig. 56 was removed. Clinically it must be distinguished from adeno-carcinoma and malignant adenoma of the body of the uterus. The haemorrhage is often so intractable as to necessitate extirpation of the uterus.

Localized hypertrophy of the mucous membrane, with glandular proliferation, gives rise to the formation of mucous polypi. They may be present at any age, but are more frequent in late than in early sexual life.

Aetiology of Pathological Hypertrophy and Hyperplasia.—Careful analyses of long series of cases, in which the uterus has been curetted, fail to prove any aetiological relationship between conditions hitherto thought to be responsible and glandular hyperplasia. Reference has already been made to the fact that inflammatory lesions of the uterus or other pelvic organs are not to blame. It is possible that a hyperaemia, apart from menstruation, may result in increase in the number and in the activity of the glands. Apart from such hyperaemia uterine displacements have little or no effect. Büttner, in an analysis of 87 cases of retroflexion and 9 of prolapse, found an excessive development of the glands present in 20·8 per cent, whilst in 106 normally placed uteri it was present in 16·4 per cent. Hypertrophy and hyperplasia are present in 50 per cent of uterine fibroids (Schickele and Keller), and there is a tendency to cystic dilatation and convolution and invagination of the glands. The absence of definite knowledge regarding its cause is not strange when we consider that the same may be said of other forms of new growths. The theory that many of the cases are due to disordered ovarian function seems at the present time the most rational one.

Symptoms.—As recent investigation has shown that the number of cases in which a pathological glandular hypertrophy and hyperplasia is present is much more limited than used to be supposed, so research has proved that the condition is not responsible for many of the symptoms formerly ascribed to it. Menorrhagia, dysmenorrhoea, leucorrhoea, sterility or frequent abortion, pain in the back, dyspepsia, and constipation, are some of the symptoms which have been ascribed to so-called glandular endometritis, or, as we now call it, glandular hyperplasia. This group of symptoms is certainly common, associated with a uterus either normal in position or displaced, sometimes harder in consistence than normal. A diagnosis of endometritis is commonly made on such a clinical picture. Curettage is performed, an examination of the curettings made, and more or less glandular hyperplasia found. Hitherto the latter has been accepted as a sufficient explanation of the symptoms complained of. Critical examination of such scrapings, in the light of our present knowledge, fails, however, to confirm this view. All recent writers on the subject, many of them differing from each other regarding the aetiology of glandular

hyperplasia, are agreed that there is no direct causal relationship between such hyperplasia and excessive bleeding. According to Büttner only 15 per cent of women between twenty and thirty years of age with profuse menstruation show glandular hyperplasia, whilst it is present in 8 per cent of normally menstruating women of the same age. In women below twenty years of age 11.1 per cent of those with excessive menstruation show glandular hyperplasia. Schickele and Keller, in an investigation of 116 cases of menorrhagia of various types, found abnormal glandular changes in only 11. Cases of glandular cystic hypertrophy or villous endometritis, whether occurring in early or in late sexual life, are associated with excessive uterine haemorrhage, but that this haemorrhage is not primarily due to the condition of the mucous membrane is shown by the frequent failure of curetting to effect a cure. In the excessive haemorrhages which sometimes occur at the time of puberty only normal or subnormal glandular development is the rule. The figures quoted bear out what every one who has examined numbers of uterine scrapings has found, namely, that there is no constant relationship between menorrhagia and the glandular picture. Menorrhagia, when present, must be due to some other condition, either of the mucous membrane or the uterine adnexa.

Vascular dilatation and thickening of the vessel walls in the endometrium have been held responsible by some (see "Chronic Metritis," p. 117). Loss of muscular power in the uterus, due to an excessive fibrosis, may be the cause. Outside the uterus the ovary is chiefly, some hold entirely, responsible for disturbances of menstruation. Derangement of its function results in disturbance of the menstrual cycle, and is therefore probably responsible for both the abnormal haemorrhage and the abnormal glandular picture, which are sometimes associated. In addition to the ovary the other organs of internal secretion probably play a part. The haemorrhage which occurs in cases of myoma of the uterus has been ascribed in part to the glandular proliferation sometimes associated with it. This glandular proliferation is not so frequent as used to be supposed, and menorrhagia is not more common in cases where it is present than in those where it is absent. It is generally recognized that in women with fibroids menstruation tends to persist till late in life. This must be due to ovarian influences rather than to any abnormal condition of the mucosa, and we know how frequently pathological conditions of the ovary are present in such cases.

It would appear therefore that glandular hyperplasia is not a direct cause of excessive uterine haemorrhage, but that both may be due to a common cause, probably ovarian. Hyperthyroidism is generally recognized as a cause of menorrhagia, and the secretions of the other ductless glands may also have some influence.

According to Blair Bell, an altered calcium metabolism may be the cause in some cases.

There is nothing in the microscopic appearance of the uterine mucosa in cases of glandular hyperplasia to explain the occurrence of dysmenorrhoea or pelvic pain. When such is present it must be due to some condition of the muscular or peritoneal wall of the uterus, or to some inflammatory or congestive lesion of the uterine appendages.

Leucorrhoea results from glandular hyperplasia, as it occurs in the pre-menstrual phase. Many women have an increased amount of secretion before and after menstruation. In hyperplasias of pathological degree one would therefore expect to find leucorrhoea as a prominent symptom. It is indeed present in some, but by no means in all. The reason for this is that in many of the cases of stationary hyperplasia and chronic cystic hypertrophy the cells of the glands apparently have little secretory function. Substances staining with muci-carmin are usually absent from the cell-body and gland-lumina. When leucorrhoea is present as the result of an uncomplicated glandular hyperplasia it takes the form of a thin watery discharge, alkaline in reaction, always more profuse before and after menstruation. In the absence of definite interstitial endometritis it contains no pus-cells.

Sterility and abortion usually result when the mucosa of the uterus is in an abnormal condition, and does not pass through the normal menstrual cycle, the pre-menstrual phase of which many regard as a preparation for the embedding of the ovum.

The general symptoms above mentioned are probably the result of associated conditions of the uterus and adnexa rather than of the mucous membrane itself.

Physical signs are as indefinite as symptoms, and of as little value in diagnosis. The demonstration of a mucous discharge in excess of normal, coming from the interior of the uterus, may lead us to suspect some glandular hyperplasia, but, as we have seen, its absence does not exclude the condition. On bi-manual examination the uterus may be found to be enlarged, soft, and tender. There is frequently an associated cervical catarrh and erosion, but such may be present, especially in nulliparous women, without any glandular hyperplasia in the endometrium.

Diagnosis.—A consideration of the foregoing observations makes it clear that there is no certain way of diagnosing glandular hypertrophy and hyperplasia apart from microscopic examination. There are no characteristic symptoms among the many of which the patient may complain, which are pathognomonic of glandular increase. In making the diagnosis by the microscope it is necessary to have exact

information regarding the menstrual history. The only conditions liable to be confused with it are adeno-carcinoma and malignant adenoma of the endometrium. The latter especially may give rise to considerable difficulty, as the glands retain their form, and there may be no evidence of malignant action in the form of plugs of cells invading the stroma. The closeness with which the glands are set, the absence of secretion from their interior and from the cell bodies, taken along with a history of menorrhagia and irregular uterine haemorrhage, occurring in a patient about the age of the menopause, ought to make one suspicious. Fig. 58 is a

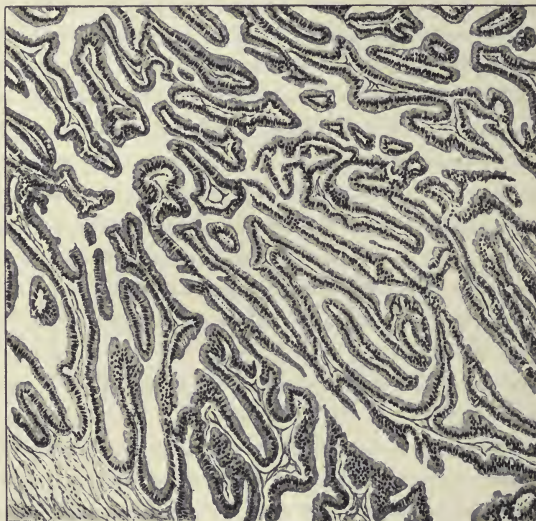


FIG. 58.—Mucous membrane from a case of malignant adenoma of the uterus. Sections of the uterine wall show deep penetration of the glands into the muscular coat. (Low power.)

section from such a case. The uterus was subsequently removed, when it was found that there was a very extensive invasion of the muscular wall by the glandular epithelial proliferation. In adeno-carcinoma there is a breaking through of the basement membrane of the glands by epithelial masses, in the cells of which mitotic figures may be present. In simple glandular hyperplasia the basement membrane is always intact, and any heaping up of epithelial cells occurs towards the lumen.

Treatment of Glandular Hyperplasia.—As we have seen, glandular hyperplasia in itself is not a condition which gives rise to any marked symptoms. It should not therefore call for any special treatment. The object in such cases should be to treat the cause of the hyperplasia, and of the symptoms associated with it. What those

causes are is by no means definitely settled. We may say that it is in most instances a derangement of ovarian function, but until we know something more of ovarian physiology and pathology this helps us little. Thus it is that our treatment is still more or less empirical and symptomatic.

With the old conception of the pathology and symptomatology of 'glandular endometritis' curettage was regarded as the sovereign remedy. Later conceptions of the condition have led to a systematic study of the results obtained by curettage in such cases. These investigations go to show that only in a small number of cases is it followed by definite disappearance of symptoms. Busse¹ reports on 500 cases, and in only 10 per cent did cure of menorrhagia result from curetting. Schickele and Keller had failures in 60 per cent. In the 40 per cent that were cured only 10 per cent showed glandular hyperplasia. When cure of menorrhagia has resulted from curettage it has been supposed that the presumably pathological mucosa removed has been replaced by one normal in structure. Werth,² however, points out that if glands were abundant in the curetted membrane they are equally abundant in the regenerated one. It is therefore doubtful if the benefit which follows in the 10 per cent of cures is due to the removal of the mucous membrane or to some other effect on the pelvic organs. When excessive haemorrhage is due to an incomplete abortion or retention of fragments of placenta or membrane after parturition, the cure which follows curettage is directly attributable to the removal of the abnormal tissue, which is not reproduced during the subsequent regenerative process. These are practically the only cases in which a cure of excessive haemorrhage can be confidently expected as the result of the operation. In the haemorrhages of puberty it usually has no effect, and most authorities now discountenance it in such cases. The operation will still continue to be performed in cases presenting the clinical picture of so-called 'glandular endometritis,' but it will be with the object of establishing a diagnosis rather than of effecting a cure. There can be no question that curettage is too lightly and too often employed. It may be of benefit in so far as it usually involves rest in bed for some time after, and during that time the patient is given the benefit of general and local treatment. Such treatment is of the utmost importance, and may result in relief of symptoms without recourse to operation. Curettage also may relieve symptoms by depleting the uterus, and giving a fresh start to retarded involution after abortion or child-birth. Clinically there can be no doubt that an enlarged, heavy uterus tends in many cases to diminish in size after the operation.

¹ Franz Veit, *Ergebnisse der Gebürts. und Gyn.* Bd. ii., 1910.

² Cited by Hitschmann and Adler, *Arch. f. Gyn.*, 1913.

Some of the cases of irregular menstruation and excessive haemorrhage are due to lesions of the ovary and the tubes, and the appropriate treatment of these often results in the re-establishment of the normal menstrual function.

In glandular cystic hypertrophy haemorrhage is generally so persistent and intractable that extirpation of the uterus is necessary. In other cases, which resist ordinary treatment, the menstrual loss may be reduced to normal limits by the excision of a wedge-shaped portion of the uterus. Benefit has been reported from the action of X-rays and radium (see Vol. III. p. 837). This treatment is more suitable for patients near the age of the menopause than for younger women, as permanent atrophy of the ovary may result.

Local and general treatment, such as is mentioned in connection with interstitial endometritis, should in all cases be carried out, whether any operative procedure is used or not.

CERVICAL EROSION

By Professor B. P. WATSON
(Toronto)

By cervical erosion is meant a condition in which there is an adenomatous overgrowth of the mucous membrane of the cervical canal, with a tendency to extension of this altered mucous membrane beyond the limits of the external os on to the vaginal portion of the cervix. The name, as is the case with so many others commonly used to designate pathological conditions of the female genital organs, is not accurately descriptive of the actual lesion present. The term 'erosion' suggests the presence of a raw surface, and as we shall see, this is not observed in the condition under consideration. Other names which have been applied to it are *cervical catarrh*, *endocervicitis*, *mucous patch*. Probably a better term than any would be *proliferative adenoma*. Ruge and Veit were the first to demonstrate the adenomatous character of the lesion, and to dispel the idea previously held that the condition was a true ulceration.

Pathological Anatomy.—In the normal cervix there is a sharp line of demarcation at the external os between the mucous membrane lining the cervical canal and that covering the vaginal portion. The former is composed of a connective tissue of ordinary type, covered with a single layer of tall columnar epithelial cells of the mucous type, with the nuclei deep down towards the base, and the free margin distended with secretion. In the substance of the membrane are racemose glands lined with the same type of epithelium. These glands open on the surface, and discharge their tenacious mucous secretion into the cervical canal. The mucosa of the vaginal portion is covered with a stratified squamous epithelium in many layers, and contains no glands. At the line round the external os, where those two types of epithelium meet, there is a sharp transition. According to Ruge, in the foetus the columnar epithelium of the cervical canal extends beyond the external os, and Fischel has pointed out that there may be a persistence of this condition, giving rise to what may be termed a congenital erosion.

The commonest cause of erosion is laceration of the cervix resulting from child-birth, or more rarely from some plastic operation on the cervix. When the small cervical tear, which occurs in every first labour, heals, the stratified squamous epithelium of the vaginal portion covers the granulating surface as far as the margin of the tear, and no disability results. When, however, the tear is a deep one, and more especially if it be bilateral, there is a tendency to eversion of the divided lips,



FIG. 59.—Follicular erosion of the cervix. Section from vaginal aspect of cervix through catarrhal area. Note the covering of a single layer of tall columnar epithelium, and the presence of glands, many of them widely dilated. (Low power.)

so that the mucous membrane of what was the cervical canal is exposed in the vagina. Infection of an acute or subacute character is apt to occur, and the resulting fibrosis leads to a great thickening of the substance of the cervix, and further rolling out of the margins. The irritation produced by the friction of the vaginal walls, the exposure to the acid vaginal secretions, together with that due to the accompanying inflammation of the connective tissue, leads to a proliferation of the surface- and glandular-epithelium, and an adenomatous overgrowth of the glands. As a result

the mucous membrane becomes greatly thickened, often in cushion-like folds of bright-red or dark-purple colour. The condition may be limited to the inner surface of the exposed lips, but there is a tendency for the cylindrical epithelium to extend beyond the margins of the tear, and to replace the squamous epithelium normally present on the vaginal aspect (Fig. 59). Along with the surface-epithelium go the racemose glands, so that they become embedded in the substance of the vaginal portion, on the surface of which their ducts open. The extent to which this invasion occurs varies. It may be limited to the margins of the tear and to the external os, or it may spread over the greater part of the vaginal portion.

A similar condition may result from gonococcal infection without cervical laceration.

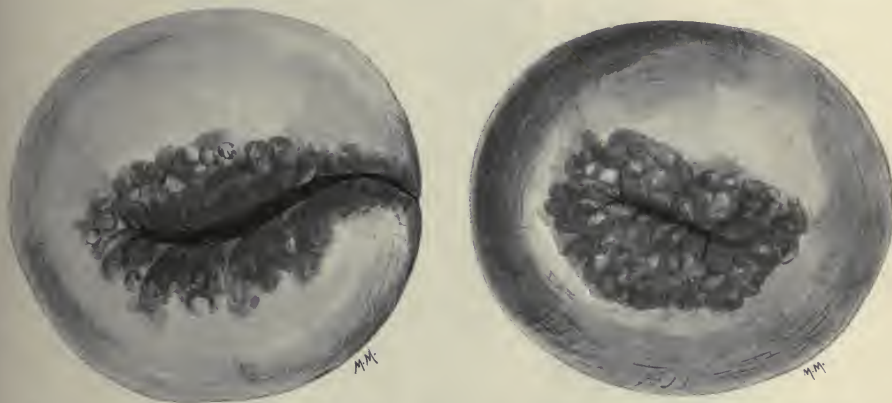


FIG. 60.—Cervix, with cervical erosion, as seen through the speculum. On the left is a nulliparous os with an erosion round the margin. To the right is a cervix deeply lacerated, with the erosion extending out from the margins of the tear.

tion. The cervical canal is very often the primary seat of gonorrhoeal infection. It sets up an inflammatory condition of the stroma of the mucous membrane, with great thickening, due to the presence of congestion, oedema, and inflammatory exudate. As a result the mucosa of the cervical canal tends to bulge through the external os. At a later stage, when the inflammation is more chronic in nature, there is a tendency to glandular proliferation and for the mucosa of the cervical canal to extend beyond the *os externum* (Fig. 59).

Whilst cervical erosion is most commonly met with in parous women with cervical laceration, and in those who have been exposed to gonorrhoeal infection, it is also met with in nulliparous patients and virgins, in whom gonorrhoeal or other infection may be excluded. Some of those cases may be of a congenital nature, as pointed

out by Fischel. The erosion is usually more or less symmetrically situated round the margin of the os (Fig. 60). Thickening of the substance of the cervix is usually absent, and on microscopic examination there is little evidence of chronic inflammatory

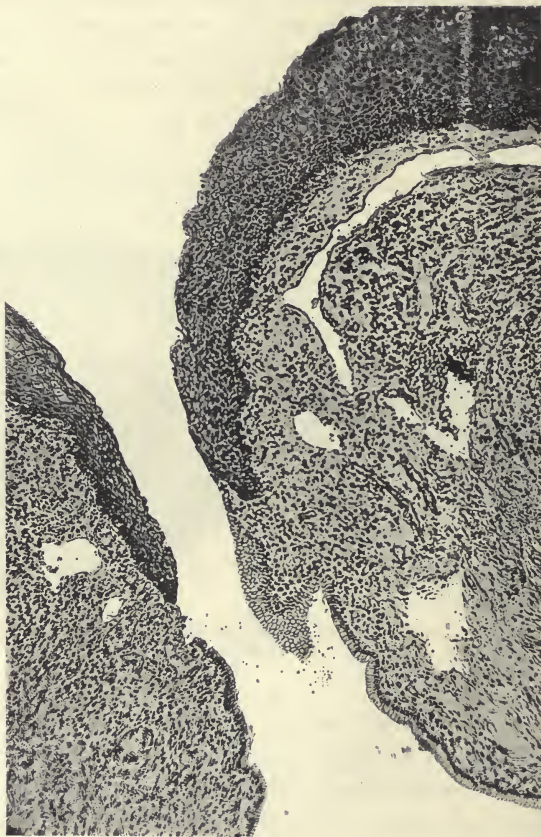


FIG. 61.—Erosion of the cervix in the process of healing. The newly-formed squamous epithelium covers the surface, and is dipping down into the mouth of the gland. Note the marked dilatation of the vessels and stroma, and the highly cellular character of the latter. (High power.)

reaction. It is difficult to account for the occurrence of the condition in those cases. It is sometimes but not always accompanied by a glandular hyperplasia of the endometrium.

Microscopic Appearances.—Sections through the cervical erosion show a covering

of a single layer of columnar epithelium, similar to that which lines the cervical canal. The surface is broken by the mouths of glands, the deeper parts of which are embedded in the stroma. The stroma may exhibit signs of inflammatory reaction in the form of dilated vessels, the presence of small-celled infiltration, of polynuclear

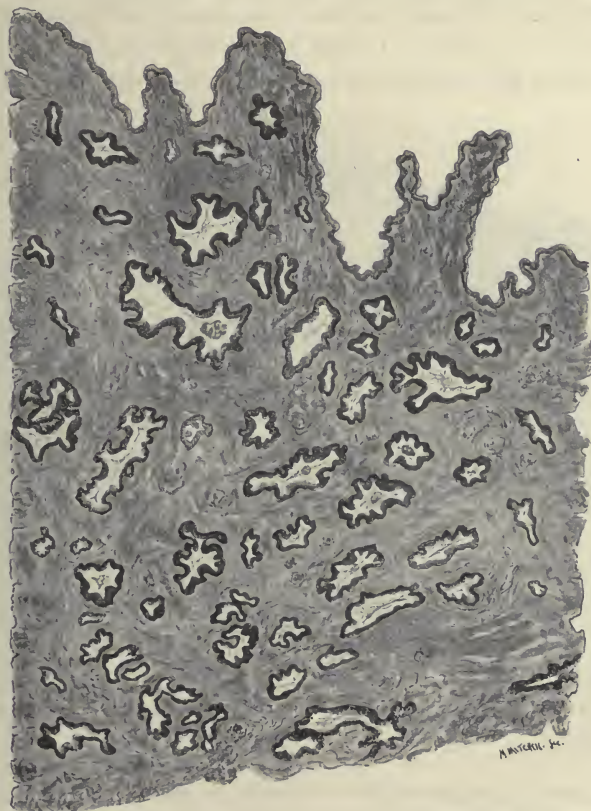


FIG. 62.—Erosion of the cervix. This is a mixed papillary and follicular erosion. The surface is not so villous as in Fig. 63, but more glands are present. (Low power.)

leucocytes (Fig. 61), or those signs may be absent. The glands may be numerous and normal in size, but are often widely dilated and filled with mucous secretion (Figs. 59 and 62). To this type the term *follicular erosion* is applied. In other cases the glandular proliferation and dilatation are not so marked, and the surface is thrown into papillary projections, consisting of a core of connective tissue, covered with columnar epithelium (Fig. 63). This is called *papillary erosion*. Very often there is a

combination of the two types, such as is shown in Fig. 62. This is sometimes called a *simple erosion*. At the margin of the erosion there is a sharp transition from the abnormal columnar to the normal squamous epithelium of the vaginal portion. At the external os it merges imperceptibly into that lining the cervical canal.

After persisting for some time there is a tendency for the erosion to 'heal,' that is for the squamous epithelium to form again over the area invaded by the cervical mucosa. In this process the columnar epithelium of the surface disappears, and

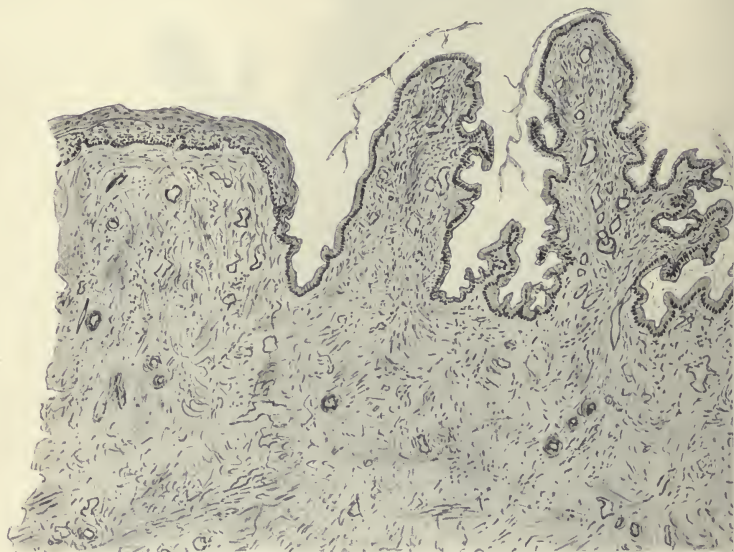


FIG. 63.—Papillary erosion of the cervix. Section through the vaginal portion at the edge of the catarrhal area. Note the replacement of squamous epithelium by the single layer of columnar epithelium. The surface is thrown into papillary projections, and there are not so many glands present as in Fig. 62. Mucus is present in the glands and clings to the surface.

most of the glands undergo atrophy. Whilst this process is going on an appearance, such as is shown in Fig. 64, is common. The squamous epithelium has completely covered the surface of the vaginal portion, and is growing down along the mouth of a gland, the deep part of which is still intact and functioning. As the result of fibrous overgrowth in the stroma, and of the growth of the squamous epithelium, the mouths of such functioning glands may be obstructed. The result is the formation of retention cysts. Fig. 65 shows this condition. The vaginal surface has become completely re-covered with squamous epithelium, but the glands remain as cystic cavities in the stroma. To them the term *Nabothian follicles* is applied. They vary

in size from a lentil seed to a pea, and in cases of cystic disease of the cervix may be as large as a grape. They contain thick tenacious mucus, which escapes under considerable pressure when the cyst is punctured. The lining in the smaller cysts is a single layer of columnar epithelium, tall like that lining the cervical canal, but it is flattened out by pressure in the larger ones. In some it completely disappears.

Physical Signs and Symptoms.—On vaginal examination the erosion, situated

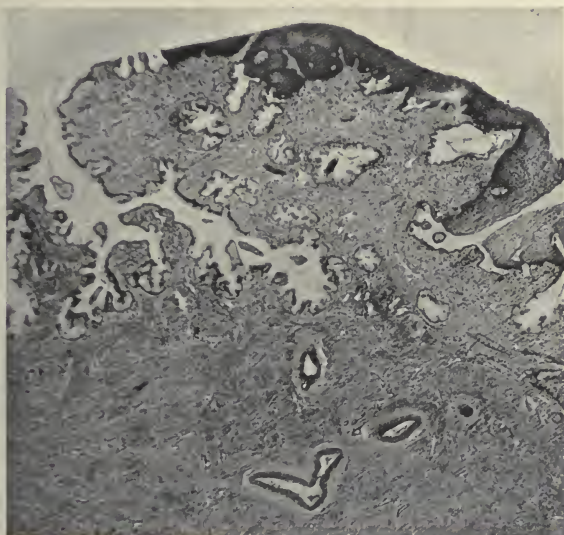


FIG. 64.—Erosion of the cervix in the process of healing. The squamous epithelium has grown over the greater part of the area. Some of the glands still remain underneath the newly-formed epithelium, but none of them are widely dilated. (Low power.)

around the external os or at the margins of a laceration, feels soft and velvety to the touch. The latter feeling is especially pronounced in papillary erosions. With practice the condition can be diagnosed by touch alone, but is made more certain by inspection of the cervix through the speculum. The catarrhal patch shows as a red congested area, looking not unlike the surface of a granulating wound. Hence arose the error of describing the condition as one of ulceration. The red colour is merely due to the thinness of the epithelial covering, in contrast to that which is normally present on the vaginal aspect. The surface bleeds readily if it is manipulated roughly with the finger or an instrument. It is, however, not friable, as in carcinoma of the cervix. The surface is usually covered with a thick tenacious secretion, clear in

colour when there is no infective lesion present, purulent or muco-purulent when the gonococcus or other organism is the responsible agent.

When healing has occurred, restoration to normal may be almost complete, but usually the substance of the cervix remains permanently thickened, and Nabothian follicles are present. The latter are more easily detected by touch than by sight. They appear to the finger as hard shot-like bodies, situated immediately under the surface. On inspection they present a bluish appearance, but do not project so much

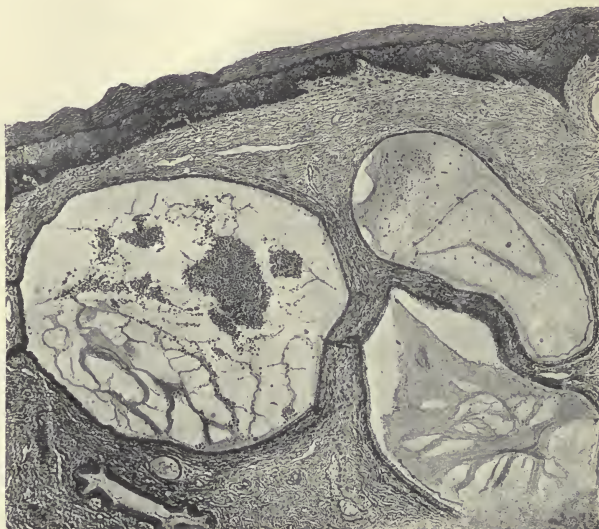


FIG. 65.—Nabothian follicles in the cervix. The section is through the vaginal aspect, and shows the surface squamous epithelium completely restored. Underneath it are several dilated glands filled with secretion. The lining cells are of the same type as those normally present in cervical glands. (Low power.)

as digital examination would lead one to expect. They are especially numerous where there have been extensive bilateral or multiple lacerations, followed by inflammatory reaction and great thickening and cicatrization of the cervix. In such cases the uterus is usually found to be larger than normal, as the result of subinvolution, which so often results from cervical laceration.

The prominent *symptom* resulting from erosion is leucorrhoea. This is of a mucous character in non-infected cases, muco-purulent when infection is present. The leucorrhoeal discharge is usually more profuse immediately before and after menstruation. Menorrhagia is frequently present as the result of subinvolution.

The abnormal condition of the mucous membrane frequently causes sterility, and if pregnancy does occur there is a tendency to abortion. During pregnancy there is said to be an increased tendency to excessive morning sickness and other phenomena, which are regarded by some as reflex. A great number of nervous disturbances and slight mental derangements were formerly ascribed to the condition, but it is very doubtful to what extent this is true. The symptoms may last for a number of years. When the erosion heals the leucorrhoea diminishes in amount, but the patient may still suffer from a feeling of weight in the pelvis, with vague pelvic pains, due to the fibrous enlargement of the cervix and fibrotic changes in the uterus. Throughout the course of the disease there is very often a condition of chronic ill-health, with dyspepsia, constipation, and anaemia. In some cases those conditions would appear to be a cause rather than a result, as treatment of them is often followed by improvement in the condition of the cervix.

Differential Diagnosis.—The conditions likely to be mistaken for cervical erosion are tuberculosis, syphilitic ulceration, and cancer. Of the three, early *tubercle* of the cervix is the one which most nearly resembles erosion of the cervix in feeling and appearance. The surface of the tuberculous lesion is softer and more velvety to the feel, and bleeds more readily on palpation. Thus there is usually irregular vaginal haemorrhage apart from examination (see Vol. I. p. 603). When syphilitic ulceration is present there are other evidences of the disease, and it seldom has the symmetrical arrangement round the external os.

The important distinction between cervical erosion and *cancer* is the friability of the surface in the latter. In cases of healed erosion, with fibrous indurated cervix and Nabothian follicles, considerable doubt may exist as to whether there may not be commencing carcinoma. In such cases the application of a curette to the suspected surface is helpful. If there be only fibrous induration, as the result of an old catarrh, the curette makes little or no impression on the surface, whereas in cancer large pieces of tissue are scooped out. The question should, however, be finally determined by microscopic examination. A healing erosion, with squamous epithelium dipping down into the glands, must not be mistaken for cancer microscopically.

Treatment.—Though cervical erosion is a definitely localized condition, attention to general treatment must not be neglected. It may often effect a cure without any local treatment being used, and it will always make the latter more certain in its effect. It involves careful regulation of the bowels and of the digestive function, the administration of tonics and of iron when there is anaemia, the regulation of exercise. Very often a change of scene and climate does good, and there should be

rest from sexual activity. If there is a pronounced diathesis, such as a gouty one, appropriate treatment should be carried out.

Local treatment consists in the use of vaginal douches and tampons containing suitable medicaments, in the application of substances of various kinds to the affected surface, and in operative procedures. The two first-mentioned methods are curative only in early and slightly marked cases. When there is marked adenomatous overgrowth and cystic dilatation of the glands operation gives the best hope of a speedy and permanent cure. In the milder cases the douche which we have found to be most satisfactory is perchloride of mercury in the strength of 1 in 5000. It may be used in conjunction with tampons saturated with a 10 per cent solution of ichthyol in glycerin. The tampons are placed in contact with the cervix, and allowed to remain for thirty-six hours. When they are withdrawn a douche is given. This is repeated twelve hours later, and then a fresh tampon is inserted. In cases where there is a gonococcal infection applications of nitrate of silver in a strength of 40 grains to the ounce, or of argyrol in a strength of 40 per cent, do good from their germicidal action. They have, however, little effect on the adenomatous tissue. To destroy it, and allow the squamous epithelium to re-assert itself, something stronger is required, but the use of strong caustics like chloride of zinc is dangerous on account of deep sloughing and subsequent cicatrization. Better results are got by thoroughly scraping the surface with a sharp curette, so as to remove all the superficial epithelium and the abnormal glands. Pure carbolic acid, or iodized phenol, is then applied. Previous to this the cervical canal is dilated, and the uterus and cervix thoroughly curetted. A light gauze pack is placed in the vagina to prevent injury from the carbolic. This is withdrawn at the end of twenty-four hours. Subsequent treatment consists in douching with corrosive sublimate twice a day, and if necessary another application of pure carbolic acid is made. This is the treatment most likely to be successful in nulliparous patients, and in those with slight laceration of the cervix.

When the erosion is extensive, and there is an accompanying thickening and glandular overgrowth in the cervical mucosa, the best results are obtained by complete excision of the affected mucous membrane. The cervix is thoroughly dilated, and the uterus curetted. The cervix is then slit by two lateral incisions into an anterior and a posterior lip. These are retracted, and the cervical canal and mucous membrane exposed and completely removed by scissors or a knife, along with the catarrhal area. The raw surface is then closed in by stitching the apex of each lip to the cut edge of the mucosa at the internal os. A few lateral sutures require to be inserted on each side. When the erosion is situated round the edge of an old laceration trachelorrhaphy should be performed (see p. 174). If the lacerations are

multiple, and the cervix hard, thickened, and indurated, amputation of the vaginal portion gives the best results. (For a description of this operation see p. 185.)

In cases where the erosion has healed, and the cervix is not much indurated, but contains numerous Nabothian follicles, the latter may be punctured with a sharp-pointed knife, and the resulting cavity treated with pure carbolic acid. Multiple punctures in the substance of the cervix may help to reduce congestion.

CHRONIC METRITIS AND ALLIED CONDITIONS

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Introduction.—So much has been written on this subject, with such conflicting accounts of the pathology and even of the nomenclature, that the task of writing a clear account, true to fact and doing justice to the various views, is an exceedingly difficult one.

Under the terms ‘chronic metritis,’ ‘fibrosis,’ ‘climacteric haemorrhages,’ ‘arterio-sclerosis,’ ‘haemorrhagia myopathica,’ ‘chronic areolar hyperplasia,’ authors are apparently describing the same type of uterus, or at any rate uteri which give the same clinical symptoms.

The earlier writers discussed the subject from the clinical aspect, scant attention being given to pathology. Bennett,¹ in 1849 devoted thirteen pages to causes, symptoms, and progress, and only seven lines to pathology. Scanzoni,² in 1863, was the first to write a scientific article on this subject, but so unsatisfactory were histological methods in those days that he swept the microscope aside as useless, and wrote the pathology of this disease entirely from macroscopical appearances. He describes two stages: (1) stage of infiltration, in which the uterus is enlarged, soft, hyperaemic, and infiltrated; (2) stage of induration, in which the uterus is indurated, hard and anaemic, and the arteries and veins much reduced in calibre. He states that any acute inflammatory condition may become chronic in character and end in the stage of induration. Serfert,³ in 1866, and Saxinger,⁴ in 1867, differed from Scanzoni, and found the condition to be due to subinvolution. Klebs⁵ found increase of muscular tissue. For some time subsequent to this, chief attention

¹ Henry Bennett, *Practical Treatise on Inflammation, Ulceration, and Induration of the Neck of the Uterus*, London, 1849.

² Scanzoni, *Die chronische Metritis*, 1863.

³ Serfert, *Prager Vierteljahrsschrift*, xxiii. 1-4, 1866 (Gardner and Goodall).

⁴ Saxinger, *Prager Vierteljahrsschrift*, xiv. 1, 1867 (Gardner and Goodall).

⁵ Klebs, *Handbuch der pathologischen Anatomie*.

was given to the endometrium owing to the introduction of the curette and, at a later period, to bacteriology; but in 1883 Fritsch¹ again drew attention to the histology of the myometrium. He found an increased amount of fibrous tissue and the vessel-walls greatly thickened and stiffened, frequently there was complicating perimetritis and endometritis. Pichevin and Petit,² in 1895, published one case in which the chief change was atheroma and arteritis obliterans; they also noted atrophy of muscle. Reinecke,³ in 1896, attributed the bleeding in four cases to arterio-sclerosis of the larger vessels.

Up to this period workers on this subject had been handicapped by want of material, their observation being made from uteri removed post mortem, or from an extremely small number of operation specimens. From this time onwards hysterectomy for this condition became much more frequent, and there was consequently more abundant material, but still came the same conflicting reports upon the pathology. Theilhaber,⁴ in 1902-3, published a series of papers based on nine uteri removed for chronic metritis which Lorentz⁵ had examined for him, and compared these uteri with a series of sixty-one normal uteri of various ages examined by Meier.⁶ He came to the conclusion that the haemorrhage was due to replacement of much of the muscular tissue of the uterine wall by connective tissue, consequently the uterine muscle was not so well able to control the flow of blood through the vessels. In a few cases there was accompanying endometritis which he regarded as secondary to the chronic metritis. Palmer Findlay,⁷ in 1905, considered the bleeding to be due to a fibrosis of the uterine wall, accentuated by a fibrosis of the tunica media of the arteries, which prevented compression of the vessel-wall by the uterine muscle. This fibrosis he considered to be secondary to some long-continued general passive congestion, such as an incompetent heart, obstruction to lung, liver, kidney, etc. Anspach,⁸ in 1906, described uteri which cause haemorrhage, and which are practically the same as those diagnosed as "chronic metritis." He concluded that no anatomical lesion has yet been found, but that it will probably be found in the elastic tissue of the vessel-wall and of the subserous

¹ Fritsch, Bilbroth-Lücke, *Handb. de Frauenkrankheiten*, Bd. i.

² Pichevin and Petit, *Gaz. Méd. de Paris*, 1895.

³ Reinecke, "Die Sklerosis der Uterus-Arterien in der klimakterischen Blutungen," *Archiv für Gynäkol.* Bd. liii. Heft 2.

⁴ Theilhaber, "The so-called Chronic Metritis, its Causes and its Symptoms," *Archiv für Gynäk.* vol. lxx.

⁵ Lorentz, *Archiv für Gynäk.* ii., 1903.

⁶ Meier, *Archiv für Gynäk.*, 1902, p. 15.

⁷ Palmer Findlay, "Arteriosclerosis of the Uterus as a Causal Factor in Uterine Haemorrhage," *Amer. Journ. Obst.*, July 1905.

⁸ Anspach, "Metrorrhagia Myopathica," *Amer. Journ. Obst. and Diseases of Women and Children*, Jan. 1906.

and supravascular layers of the mesometrium. His description of the changes found and his illustrations exactly tally with later work ; only in his conclusions is he not sufficiently dogmatic. In 1906¹ I published the results of the examination of thirty-one uteri removed for chronic metritis, and compared them with twenty-three normal uteri, but I was unable to confirm Theilhaber's conclusions, and pointed out that the great increase in the uterine tissue consisted of muscle fibres.

Gardner and Goodall,² in 1906, published a most valuable paper on this subject. They divided the specimens into two pathological groups, simple and complicated ; but their chief advance was to note differences in the causation of the condition : from the point of view of etiology they divided their cases into four groups as due to subinvolution, inflammation and congestion, new growths, and arterio-sclerosis.

In 1910 Goodall³ published a paper on the involution of the puerperal uterus which will be largely quoted later, and in the same year another on " Climacteric Haemorrhages,"⁴ in which he concluded that the chief histological change consisted in the collection of a large amount of elastic tissues around the blood-vessels.

In 1914 Donald⁵ and Shaw⁶ described a small class of uteri occurring in nulliparae which are clinically indistinguishable from chronic metritis, but in which the pathological change appears to be a pure hypertrophy of the myometrium secondary to hypertrophy of the endometrium.

Almost every observer comes to a different conclusion, and the questions to be settled after reading through the literature are: (1) Is the condition due to septic infection or not ? (2) Is the increase in size of the uterus due to increase of muscle, of connective tissue, or both ? (3) Does increased elastic tissue play any part in the production of symptoms ? (4) Is the condition secondary to endometritis, or is the thickened endometrium, found in many cases, secondary to the change in the myometrium ? (5) Can arterio-sclerosis produce the symptoms ?

All the authors quoted are competent observers trying to elucidate the problem, not writing with the object of merely refuting each others' opinions. The condition is one of the commonest found in gynaecology, and material for research work is

¹ W. Fletcher Shaw, " The Pathology of Chronic Metritis," *Trans. Obst. Soc. London*, vol. xlix. p. 19, 1907.

² Gardner and Goodall, " Chronic Metritis and the Arterio-Sclerotic Uterus," *Brit. Med. Journal*, Nov. 1906.

³ Goodall, " The Involution of the Puerperal Uterus, and, more particularly, the Involution of its Circulatory System, Vitreous Hypertrophy, and Vitreous Degeneration of Elastic Tissue," *Studies from the Royal Victoria Hospital, Montreal*, vol. ii. No. 3 (Gynaecology).

⁴ Goodall, " Climacteric Haemorrhages," *Amer. Journ. of Obstetrics*, Jan. 1901.

⁵ A. Donald, " A Case of so-called Chronic Metritis in a Nullipara," *Proceedings Roy. Soc. Med. (Obst. Sect.)*, 1914, vol. vii. p. 357.

⁶ W. Fletcher Shaw, " The Subdivisions of Chronic Metritis," *Journ. of Obst. and Gyn. Brit. Emp.* vol. xxvi. p. 73, 1914.

now abundant. What then is the reason for such different results? The only answer is that these observers are dealing with conditions which, although they give rise to the same clinical symptoms, differ from each other in pathology and aetiology.

From this rapid review of the literature it will be seen that the first view of the pathology of these cases was that the changes were the late result of inflammation; hence the term "chronic metritis." This view was first deduced from clinical evidence but was supported later by microscopical investigations. This hypothesis long held the field, though two authors quite early in the controversy considered these cases to be the late result of subinvolution. At a much later date the chief pathological change was considered to be a large increase of fibrous tissue, not necessarily due to inflammation; hence the term "fibrosis uteri." This view has been held until quite recently, but all the latest observers have noted that, although the total amount of fibrous tissue is increased, the proportion is only slightly increased, and the great increase in bulk in the uterus consists chiefly of muscular tissue. Haemorrhage was supposed to occur in these cases because the increased amount of fibrous tissue prevented the muscular tissue of the myometrium from effectively contracting down on the vessels and so controlling the amount of blood passing through the vessels. A much later view is the one which ascribes the condition definitely to subinvolution, and describes the pathological change as the accumulation of a large amount of elastic tissue around the blood-vessels which prevents muscular control of the vessels just in the same way as older observers supposed the fibrous tissue to act.

Many papers have been written on the arterial changes in these uteri, to which several authors ascribe the bleeding, but the trend of later views has been to consider these as part of the general process of subinvolution.

The endometrium, at one stage of the controversy, had a good deal of attention paid to it, but, except in a very small class which has been quite recently recorded, the changes in this tissue are generally looked upon as of secondary importance.

Thus it is seen that in the first instance the condition was considered to be always due to inflammation; then gradually the views of observers changed, and the pathological condition was thought, more and more, to be due to subinvolution, until, at one period, no other condition was mentioned, the arterial changes, upon which some authors had laid so much stress, being now included in the changes due to subinvolution. But, although the great majority of these specimens fall under the pathological division of subinvolution, there are undoubtedly cases due

to inflammation alone, and moreover there is the small group due to "hypertrophy," which have been lately described.

In writing an article of this description an author naturally desires to express the general view held by gynaecologists rather than his own particular one, but in this subject each author attacks it from his own point of view, and makes no attempt at a classification which will include the views of others as well as his own. It has therefore been necessary to adopt a new classification under "pathology," a classification which is simple but which includes the types described by all these authors, and one which, from the examination of a large number of specimens, appears to be correct.

So many of these cases are due to subinvolution that many authors object to the use of the term "chronic metritis." But cases of true "chronic metritis" do occur; moreover, many cases of "subinvolution" include, in addition to the effects produced by the subinvolution, some slight changes due to inflammation, while, apart from this, a very large proportion of the specimens which show histologically nothing but the effects of "subinvolution," are in this condition because normal involution has been retarded by a slight degree of sepsis. For these reasons it is perfectly justifiable to continue the use of the term "chronic metritis" for these specimens, especially as it is quite impossible to distinguish these cases clinically. Therefore, although we must recognize that many cases of so-called "chronic metritis" have nothing whatever to do with inflammation, it seems better to continue the use of the term in a clinical sense, as all these cases have the same clinical symptoms and are only distinguishable by the microscope.

SYMPTOMS

By chronic metritis, or fibrosis, as it has become fashionable with some authors to rename this condition, is meant a uterus symmetrically enlarged and hard, which contains no new growth, and which produces the three cardinal symptoms of haemorrhage, pain, leucorrhoea, or any combination of these. Such uteri are usually found in multiparae, but they do occur in nulliparae and occasionally in virgins.

It is an exceedingly common condition, and accounts for large numbers of chronic invalids. No better description could be given of the general features of the class than that of Bennett:¹ "To this class belong a large proportion of the population of sofa, bath-chair, nervous, debilitated, dyspeptic females, who wander from one

¹ Henry Bennett, *Practical Treatise on Inflammation, Ulceration, and Induration of the Neck of the Uterus*, London, 1849.

medical man to another, and who crowd our watering-places in summer; most of them are suffering from chronic uterine inflammatory disease, unrecognized and untreated, and most of them would, if their disease were only discovered and cured, become amenable to the resources of our art, and eventually recover their health, spirits, and powers of locomotion. It is a singular and instructive fact that amongst the male part of the community there is no similar invalid population, always ill, unable to walk or ride, constantly requiring medical advice, and yet living on from year to year, neither their friends nor themselves knowing what is amiss with them, beyond the evident weakness, dyspepsia, etc."

The majority of these patients are from 35 to 45 years of age, that is to say in the last third of menstrual life, though often the patient is younger than this, and I have seen a patient of only 23 years of age upon whom it was necessary to perform hysterectomy for this condition. Although the majority of these patients upon whom hysterectomy is performed are in middle life, a very large proportion of them give a long history of symptoms, generally dating from a pregnancy, but it is often only after years of medical treatment, and when nearing the menopause, that these symptoms become so severe as to necessitate operation.

A normal virgin uterus measures three inches in length and its walls are half an inch in thickness. In chronic metritis there is always considerable enlargement of the uterus, the walls being $\frac{3}{4}$ to $1\frac{1}{4}$ inches thick. This enlargement is symmetrical, though the thickness of the walls varies slightly in different parts. The walls are of the same consistence throughout, and contain no collections of denser material or small fibromyomata, though chronic metritis may occur in the same uterus with fibromyomata; but such a case would be named from its more obvious pathological condition, a fibromyomatous uterus. Figure 66 is an outline drawing to scale of a chronic metritic uterus and a virgin uterus, and very well shows the symmetrical enlargement of the former.

The uterus may be either in the normal position of anteflexion and anteversion, or this position may be accentuated, or the organ may be retroflexed. In the last 100 patients I have examined, 26 had retroverted uteri, as against 57 with anteverted uteri, while in 17 cases the position was not noted.

The most constant symptom of which these patients complain is *haemorrhage*. This may show itself simply as menorrhagia, but, in the more severe cases, it is almost always accompanied by metrorrhagia. In the worst cases the patient is rarely free from haemorrhage, and it is very frequently found that a patient is never free from haemorrhage for more than a week at a time. Owing to this constant drain large numbers of these patients are extremely anaemic and generally run down in

health, they complain of a constant feeling of tiredness, their digestion suffers, and their nervous system is in a state of great debility; they suffer from headaches, depression, and nervous irritability. In the last 100 cases I have examined in which hysterectomy was performed, in 71 this operation had become necessary on account of excessive haemorrhage.

Pain is another common symptom and occurs in two forms, dysmenorrhoea and

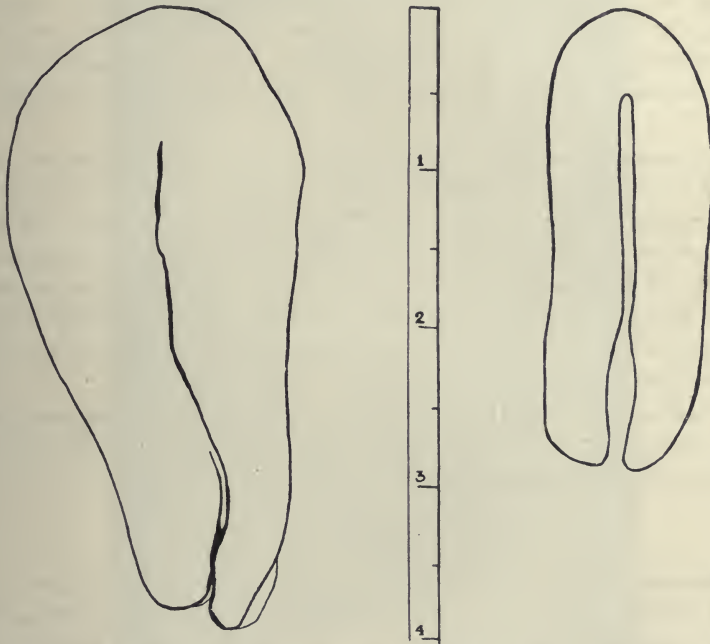


FIG. 66.—Outline drawing to scale of a chronic metritic uterus (left) and a virgin uterus (right).
(Donald.)

chronic aching pain in the iliac regions and back. Dysmenorrhoea is the less frequent of these two forms, but is still far from rare. It is seldom that a patient with chronic metritis comes for this symptom alone, usually it is accompanied by excessive haemorrhage or leucorrhoea, and all these symptoms have dated from one common period, usually a confinement. It is unusual for a patient with chronic metritis to complain of dysmenorrhoea dating from puberty; these cases usually improve with parturition, whereas in chronic metritis the dysmenorrhoea dates from a confinement. In the somewhat rare form of chronic metritis due to

hypertrophy, dysmenorrhoea is a constant feature dating from puberty and, as we shall discuss under pathology, the dysmenorrhoea is simply the manifestation of the excessive uterine contractions which produce this condition.

Chronic aching pain in the iliac region and back is a much more constant symptom. It is never a sharp, cutting pain but a dull ache, which is made worse by exertion, and practically prevents the patient from following any employment or enjoying life. This aching is due to the drag of the heavy uterus on its ligaments, and the position of the uterus, whether anteflexed or retroflexed, makes no difference to its incidence. It is this constant nagging pain, combined with general enfeeblement from haemorrhage, which makes these patients so depressed, irritable, and fretful.

Leucorrhoea is the third cardinal symptom of this condition but it is not so frequent or so distressing as the other two, although it frequently happens that a patient complains chiefly of this symptom and submits to hysterectomy for it when other methods of treatment have failed. The origin of the leucorrhoea is often doubtful. In some cases it is merely a transudation through the vaginal mucosa, owing to the lowered vitality of the patient; in others it is due to a definite infection of the uterine mucosa or cervical glands; while in many it is due to an increased secretion of the mucosa without infection.

Chronic metritis is not an absolute bar to pregnancy, but conception does not occur so frequently as in normal uteri. Moreover, pregnancy in these uteri is much more likely to end in abortion than in normal uteri.

PATHOLOGY

Macroscopical Appearances.—The uterus is symmetrically enlarged, its walls being $\frac{3}{4}$ to $1\frac{1}{4}$ inches in thickness instead of $\frac{1}{2}$ inch as in the normal virginal uterus; the cavity is much enlarged and measures 1 or even 2 inches longer than the normal. The whole organ feels firmer and harder than normal, and on bisecting it the tissue is seen to be much more 'streaky' than normal, especially marked in the outer third, and the blood-vessels are seen to be enlarged and stand out from the cut surface. This 'streakiness' of the surface is due to the muscle-bundles being separated by large quantities of elastic and fibrous tissue, as we shall see when we discuss the microscopical appearances. The endometrium may be thickened or very much decreased in quantity so that little, if anything, comes away with the curette. With this instrument the hardness of the walls is very apparent and gives the sensation of scraping the surface of hard india-rubber. Usually the endometrial surfaces are in apposition, as in a normal uterus, but in those with very thin endo-

metrium there is often a considerable space. The appendages may or may not be matted with old adhesions.

Such is the macroscopical appearance of a uterus removed with the diagnosis "chronic metritis." Figures 67 and 68 show the general appearance of such a uterus.



FIG. 67.—Posterior view of a specimen of chronic metritis.

Figure 67 is a view of the posterior wall of a chronic metritic uterus, which is 4 inches long instead of the normal 3 inches, and the width at the fundus almost 3 inches instead of 2 inches. The enlargement involves the whole of the uterus, so that the shape is that of a normal uterus with the exception that the body is rather wider and more spherical. Figure 68 shows the same uterus bisected. Here again the shape is little altered except that the general outline is more spherical owing to

the great increase in thickness of the walls. The 'streaky' appearance of the cut surface is well shown, in the midst of which the larger arteries are very prominent. The endometrium is very thin.



FIG. 68.—Drawing of a bisected chronic metritic uterus. Note the prominent vessels and the streaky appearance of the walls, and that the enlargement of the organ is symmetrical.

From the study of a large number of uteri removed with the clinical diagnosis of "chronic metritis," and from a review of the literature, it is obvious that there are several different pathological conditions included in this clinical term.

These I propose to describe in three groups: (1) chronic metritis, meaning by this the late result of an acute inflammation; (2) subinvolution; and (3) hypertrophy.

The symptoms and *macroscopical* appearances of all these groups are identical: there are fundamental differences in the aetiology, but the history obtainable from patients is often not sufficiently definite to allow of more than a very rough guess at the classification, so that it is only when we examine the specimens under the *microscope* that we can realize the enormous differences in the pathological changes which have produced these apparently similar uteri, and it is only by this means that we can attempt a classification. For this reason it seems better to retain the term "chronic metritis" for all these

uteri, at any rate as a clinical term, leaving the division to be defined in the laboratory. The classification I have adopted is a simple one on broad lines which will include all conflicting opinions and microscopical appearances described by various authors. It would be possible further to subdivide these divisions,

especially in the case of subinvolution, where the uteri could be classified according to great excess of fibrous tissue or of elastic tissue, or where the chief change is apparently in the vessel-walls, or where there is a history of syphilis, etc., but it seems better, at any rate in the present state of our knowledge, to adopt this simple broad classification.

In the last 100 specimens, clinically diagnosed as "chronic metritis," which I have examined, 95 fall into the division of "subinvolution," 4 into "hypertrophy," while there is only 1 which could be called pure pathological "chronic metritis." Of course there is a certain amount of overlapping; many of the uteri which show changes due to "subinvolution" no doubt also have some change due to "chronic metritis," and in a very large number of them the "subinvolution" was due to the presence of inflammation, although it is impossible to say that any of the histological changes are due to this condition. This is an additional reason for retaining the general term "chronic metritis."

I. Chronic Metritis.—Strictly speaking, this term should be applied only to those uteri which have undergone a pathological change due to inflammation, either the late result of an acute metritis or a chronic inflammation from the commencement. This term was first used on the supposition that the condition was caused by inflammation, but, as now used clinically, it includes very few such uteri, the majority of uteri so termed being, in reality, the result of subinvolution. Clinically, it is useful to retain the term for general application, but it is necessary when studying the pathology to divide the specimens into *pathological* classes.

Is there such a condition as true *chronic metritis*? In other words, is there a pathological change in any of these uteri clinically diagnosed as "chronic metritis" which is due to inflammation of the uterus and to inflammation alone? Many authors state that there is. Bland-Sutton¹ writes: "The change in the tissues of the uterus was a remote result of septic endometritis." His specimens are not very convincing. They are from multiparae, and very probably much of the increased amount of fibrous tissue he describes would be shown to be elastic tissue if stained with Weigert's stain, a change which, as I shall describe later, is due to subinvolution, not to inflammation. Herman and Maxwell² describe chronic metritis and subinvolution as being separate conditions, but they do not describe the microscopical appearances of the two conditions. In the whole of the literature on this subject there is much confusion between "chronic metritis" and "subinvolution," and, while the microscopical appearances of the latter condition are well described, I have

¹ J. Bland-Sutton, "Hysterectomy as a Conservative Operation," *Brit. Med. Journ.*, 1899, i. 839.

² Herman and Maxwell, *Diseases of Women*, 1913.

been unable to find a detailed description of the former definitely separated from those of the latter.

To prove that true chronic metritis does occur it is necessary to make use of a uterus which has never been pregnant, otherwise the changes due to subinvolution obscure the results, and there must be a history of infection or signs of peri-uterine inflammation. When an acute inflammation in any organ resolves, it is found that the inflammatory exudate is transformed into fibrous tissue, and in chronic inflammation muscular tissue is transformed into fibrous tissue; so in the uterus we should expect to find the changes due to the late result of an acute inflammation or to a primary chronic inflammation to be a great increase in the proportion of fibrous tissue, with an increase in the thickness and in the density of the uterine walls. In the earlier stages the tissues would be invaded with leucocytes and plasma-cells, but in the late stages these would have often completely disappeared.

Of course many multiparous uteri are removed with the diagnosis of chronic metritis in which the symptoms date from a septic puerperium and which show definite signs of old inflammation by having matted appendages, but microscopically these uteri only show changes which I shall describe under subinvolution. Amongst the 25 chronic metritic uteri which I have lately described,¹ 8 had matted appendages, while 17 showed no signs of inflammation around the appendages, but these uteri with matted appendages showed very little increase of fibrous tissue; in fact the few uteri which had any marked increase were amongst those with free appendages and no history of sepsis during the puerperium. The effect of sepsis in the puerperium is apparently to delay involution and not in itself to produce any change in the uterine wall.

In the last 100 specimens removed with the clinical diagnosis of chronic metritis which I have examined there is one, and one only, in which the changes can be described solely as the late results of inflammation of the uterine wall. That is to say, in these 100 cases there is only one to which the term "chronic metritis" can be applied in its true *pathological* meaning. The great majority of these specimens are from cases of subinvolution, and only in so far as inflammation causes subinvolution can the term "chronic metritis" be truly applied to them. Amongst these 100 specimens were several from patients described as nulliparae, but they all, with this one exception, showed changes which I shall describe later as typical of subinvolution, and there can be no doubt that these patients had had early miscarriages, and that the symptoms and the changes in the uterus were in reality due

¹ W. Fletcher Shaw, "The Subdivisions of Chronic Metritis," *Journ. of Obst. and Gyn. Brit. Emp.*, 1914, xxvi. 73.



Section from the wall of a specimen of chronic metritis due to inflammation. Note the large amount of red fibrous tissue in the wall, while the elastic tissue (black) is confined almost entirely to the elastica interna of the vessels.

Stains. Weigert's elastic and Van Gieson.



Arteries in a virgin uterus. The elastic tissue is confined chiefly to the internal elastic lamina of the arteries, with a small amount in the media (somewhat exaggerated in the drawing) and a very small amount around the muscle-fibres (yellow) of the myometrium.

Stains. Weigert's elastic and Van Gieson.

to this cause. In these 100 specimens there were also 4 from nulliparae, in which the changes could not be ascribed either to inflammation or subinvolution, and I will describe these later under the subdivision of "hypertrophy."

The one specimen in which the changes can only be ascribed to inflammation was from a patient thirty years of age, who had been married several years but had never had any signs of pregnancy. For five months previous to operation she had had severe pain and aching in the right side, and during the same period severe menorrhagia and leucorrhoea. The uterus and appendages were removed by the abdominal route, and the operation proved extremely difficult as, not only were the appendages matted, but there were universal adhesions binding the uterus to the bladder, intestines, and peritoneum, all pointing to a severe inflammatory reaction. The uterine walls were hard and considerably thickened, measuring $\frac{3}{4}$ of an inch, and the endometrium was much thickened. Microscopically, the only change to be found is a great increase in the amount of fibrous tissue, most marked in the outer third but extending in a marked degree throughout the whole of the wall. The muscle-bundles are much diminished in size, and separated by masses of fibrous tissue. The amount and distribution of the elastic tissue is not affected in the slightest degree, and so far as this tissue is concerned the section might be from a virgin uterus, as it is found only as an *elastica interna* of the arteries and in fine fibres between the muscle-bundles of the myometrium and in the vessel-walls. This uterus shows not the slightest sign of pregnancy in the microscopical appearances, but it does show the late results of a severe inflammation, so we must assume that any changes found in the uterus are due to this inflammation. These changes are exactly what, on theoretical grounds, we should expect to find as a late result of inflammation, a somewhat enlarged hard organ with a great increase in the proportion of fibrous tissue. Plate III. Figure A is taken about the junction of the outer and middle thirds of a section through the uterus. It shows the great increase in the amount of fibrous tissue and the attenuated muscle-bundles. The artery has a well-marked *elastica interna*, but, beyond this, the elastic tissue is confined to fine fibres in the vessel-walls and myometrium. This specimen then is one to which the term "chronic metritis" can be applied in a strict pathological sense, but it is the only one in a series of 100 specimens removed with the clinical diagnosis of "chronic metritis."

II. Subinvolution.—This group includes by far the largest number of cases clinically diagnosed as chronic metritis. In order to understand its pathology it is necessary to study the process of involution, work which has recently been done particularly well by Goodall, whose well-known monograph is freely used in the following description.

The normal Process of Involution.—Until recently involution was considered simply as a diminution of the muscle-fibres of the myometrium due to fatty degeneration, to a granular atrophy, or to simple atrophy. The earlier observers, Heschl,¹ Luschka,² Kölliker,³ and Säger,⁴ considered this diminution in size of the uterus to be due to fatty degeneration, some finding that the whole of the muscle-fibres were destroyed and new ones formed to constitute the new uterus, while others found the fatty degeneration proceeded only so far as to cause a diminution in size of the individual fibres. Working on rabbits' uteri, with more modern histological methods, Helme⁵ and Broers⁶ have more recently investigated the subject. Helme found no fatty degeneration, simply a diminution in volume of the muscle-fibres and connective tissue. This change is probably chemical, a sort of peptonization which makes the contents of the muscle-cells more soluble, so that they can pass into the lymph-stream. This atrophy goes on simultaneously and equally in all parts of the uterus; no groups of degenerated cells are found amid healthy tissues. Broers, on the other hand, confirmed the work of the earlier investigators and found fatty degeneration. More recently still, Goodall, in his work upon the involution of the uterus, incidentally notes that he found fatty degeneration of the muscle-fibres.

In 1880 Balin⁷ published his work on the arterial changes which occur during the puerperium. He found that the arteries underwent reduction in size by contraction of the muscular wall and by a growth of fibrous tissue in the intima. This fibrous tissue occurs as local ingrowths of the intima which extend into the lumen, causing it to become crescentic; these ingrowths are so large that frequently the calibre of the vessel is barely visible, and not infrequently complete occlusion may occur. Sometimes these growths of fibrous tissue encroach on the media, causing this to atrophy and be replaced by elastic tissue. He also found that the media undergoes fatty degeneration in the same way as the myometrium, and that this fatty change appears later and lasts longer than the corresponding changes in the uterine muscle-fibres. He found the vessels of the placental site closed by thrombi, in some of which he found a slow organization from spindle-celled fibrous tissue from the intima. This new growth of fibrous tissue gradually replaced the thrombus, leaving white spots.

¹ Heschl, "Untersuchungen über das Verhalten des menschl. Uterus nach dem Geburt," *Zeitschrift der k.k. Gesellschaft der Ärzte in Wien*, 1852.

² Luschka, *Anatomie des Menschen*, vol. ii. Div. 2, 1864.

³ Kölliker, *Handbuch der Gewebelehre des Menschen*, 5. Auflage, 1867.

⁴ Säger, *Die Rückbildung der Muscularis des puerperalen Uterus*, Leipzig, published by J. C. Vogel, 1888.

⁵ T. A. Helme, *Trans. Roy. Soc. Ed.* vol. xxxv. Pt. 11, No. 8.

⁶ Broers, *Virchow's Archiv*, Bd. cxli., July 1895.

⁷ Balin, "Über das Verhalten der Blutgefäße im Uterus nach stattgehabter Geburt," *Arch. für Gyn.* Bd. xv., 1880 (Goodall).

Szasz-Schwarz,¹ in 1903, found certain changes about the vessels which he described as typical of pregnancy, and others as typical of general arterio-sclerosis. The changes due to pregnancy consist chiefly in a great increase in elastic tissue throughout the myometrium, especially around the smaller vessels of the inner and middle coats. In some cases this pad of elastic tissue surrounds the vessels, while in others it encircles only a portion of the vessel. This pad is sharply defined; in some cases it lies adjacent to the media of the vessel, while in others it is separated by a layer of fibrous tissue. In 1906 Pankow² corroborated Szasz-Schwarz's work. He found fatty degeneration of the intima and replacement by elastoid tissue. In the thrombosed vessels are portions not involved in the thrombus, where the endothelium has proliferated to form a new endothelial lining and so defined the inner limits of the new vessel. This explains the occurrence of the large pads of elastic tissue around the delicate vessels. Solma,³ working on the ovary, found new vessels formed within the old ones, sometimes three or more, one within the other.

Goodall⁴ published his work on the involution of the uterus in 1910, and in the following description I quote largely from his paper, though I have confirmed most of his observations by studying a series of puerperal uteri.

In a virgin uterus elastic tissue occurs chiefly as the internal elastic coat of the arteries; fibrils of elastic tissue also occur in the media and adventitia of the vessels, and in the myometrium surrounding each muscle-fibre, but these fibrils are very fine and can usually be seen only with the high power of the microscope, except in the subperitoneal layer where the elastic fibrils surrounding muscle-fibres are somewhat thicker. The amount of elastic tissue in the adventitia is of the very smallest, and the fibrils are very thin. In the inner third of the myometrium there is very little elastic tissue, the elastica interna of the arteries being very thin, and the amount elsewhere reduced to a minimum, though in some arteries it is thickened from menstrual sclerosis. In the veins there is no definite elastica interna, but the walls contain a larger amount of elastic tissue than do those of the arteries, and from this are derived most of the fibres which constitute the elastic framework of the uterine body. Plate III. Figure B is a low-power view from the middle layer of a section of a virgin uterus obtained from a girl eighteen years of age, who died a few hours after an accident, and whose menstrual history was quite normal. The section is stained with Weigert's elastic stain and Van Gieson, elastic tissue being black, muscular tissue

¹ Szasz-Schwarz, "Recherches sur les altérations séniles des vaisseaux sanguins," *Revue de Gynécologie*, T. vii., 1903.

² Pankow, "Graviditätsmenstruations- und Ovulations-sklerose der Uterus- und Ovarial-gefässe," *Arch. für Gyn.* Bd. lxxx., 1906 (Goodall).

³ Solma, "Histologie der Ovarial-gefässe, etc.," *Arch. f. Gyn.* Bd. lxxxiv. H. 2 (Goodall).

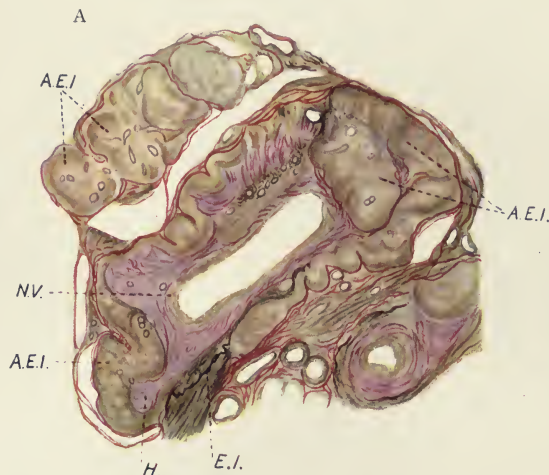
⁴ Goodall (see p. 129).

orange, and fibrous tissue red. The elastica interna of the arteries is shown as a wavy black line, the fibres of elastic tissue in the media and around the muscle-fibres of the wall are so fine as not to show under the low power, though their presence in the media is indicated in the drawing by rather thick lines, thicker than in the section; very little fibrous tissue is to be seen in this part of the section.

During pregnancy there is a great increase of all the constituent elements of the uterus. The muscle-fibres become enormously enlarged, while fibrous and elastic tissue is increased in amount, but all through pregnancy these three elements retain the same proportion and distribution as in the virgin uterus. A great change takes place in the blood-vessels of the organ; not only have they to enlarge sufficiently to supply this growing organ, but they have to convey the large amount of blood necessary to the foetus. In order to do this all the vessels enlarge, but especially those of the subplacental site, which, from insignificant vessels, become large blood sinuses. After labour the uterus undergoes the greatest tissue-change of any organ in the body. Soon after delivery the fundus is at the umbilicus, and the organ weighs from a pound and a half to two pounds and a half. In a normal puerperium the fundus is at, or below, the brim of the pelvis by the tenth day, and three weeks after delivery the organ weighs only from four to six ounces.

Involution is generally complete in two months but may take three. Very soon after delivery fatty degeneration occurs in the muscle-fibres, causing great reduction in their size while, in all probability, many are completely destroyed.

After delivery there is immediately a great reduction in the amount of blood to be conveyed by the uterine vessels and during involution there is a further great reduction, owing to the diminished uterine tissues requiring less and less blood. To meet this lessened demand great changes occur in the vessel-walls to reduce their lumina to normal capacity. The greatest changes occur in the subplacental area where the vessels, during pregnancy, are more numerous and many times as large as in the non-pregnant condition, and during involution these return to their original condition. Many of the vessels in the submucosal layer become blocked with thrombi, in others, especially in the deeper layers of the uterus, a ring of thrombus is formed which leaves their lumina still patent, though diminished in size. Coincidentally with this thrombosis the fibrous tissue in the media of the vessel becomes markedly swollen and hyaline, and the elastica interna undergoes what Goodall calls "vitreous degeneration." Instead of forming a thin black ring when stained with Weigert and Van Gieson, the elastica interna becomes enormously thickened, often ten times its former thickness, and its staining properties change. Instead of being stained black, it at first becomes brick-red in colour, then, as degeneration proceeds,



Section of a vessel containing a new smaller one. The elastica interna A.E.I. has undergone vitreous degeneration in all its course except at one spot, E.I., where it retains its black stain, and where the muscularis of the old media remains though disseminated with elastic tissue.

H. Denotes the interarterial space filled with hyaline substance. At one spot it has become invaded by elastic tissue. N.V. The new vessel within the old. In the upper left hand corner is shown a large corrugated degenerated elastica interna of a vessel cut more or less parallel with its long axis. It contains in its central part a minimum of red hyaline tissue.

In the right lower corner is seen a partially atrophic old vessel of small calibre with a still smaller new vessel in its lumen. A relatively large interarterial space filled with red hyaline tissue can also be seen. (Goodall.)



Vessels in a specimen of chronic metritis due to subinvolution. These new-formed vessels, each with a narrow elastica interna are surrounded by masses of black tissue, the remains of the elastica interna of the old vessels which has undergone vitreous degeneration, and later vitreous hypertrophy, instead of being absorbed. Towards the top of the drawing muscular tissue is shown within the black elastic tissue; here the outside elastic tissue has been derived from the elastic tissue of the old media. Stains. Weigert's elastic and Van Gieson.

bright red and finally yellow ; often all these stages can be seen in different portions of the same elastica interna, some parts being in a further stage of degeneration than others. From the brick-red stage onwards it loses its elastic properties. At this early stage then we find some vessels filled with thrombus, others lined with thrombus, and others with no thrombus at all ; most of the elastica interna is enormously swollen and has changed in colour to brick-red, bright red, or yellow ; the media contains fibrous tissue much swollen and hyaline with few nuclei.

The elastic fibrils in the media undergo vitreous degeneration, that is, they become swollen and change their staining properties, just in the same way as the elastica interna. The adventitia undergoes the same hyaline change as the fibrous tissue of the media, though somewhat later.

The next step is for the hyaline tissue of the media to flow through the degenerated elastica interna and, where thrombus is present, to convert it completely into hyaline tissue ; when no thrombus is present this hyaline material flows round the sides of the vessel adjacent to the elastica interna, leaving a lumen only of the size necessary for the new vessel.

In those vessels which are filled with thrombus, the lumen becomes completely occluded with the hyaline material, and this is gradually absorbed, so that the edges of the elastica interna gradually approximate and completely obliterate the vessel. In the vessels which contained only a layer of thrombus, or where the hyaline material flowed in without any previous clotting, a lumen is preserved which now becomes lined by a layer of cells with large nuclei, and these form the endothelial lining of the new vessel. Coincidentally with this growth, the hyaline material becomes invaded with muscle and fibrous cells which gradually convert the hyaline material into a muscular and fibrous ring, the media and adventitia of the new vessel. At this stage we find a new vessel surrounded by the old vessel-wall, the old elastica interna being much swollen and in a state of vitreous degeneration, and the old media containing swollen hyaline fibrous and elastic tissue.

Between the new and old vessel-walls is the "interarterial space," as Goodall calls it, a space filled with hyaline material.

Plate IV. Figure A, copied from Goodall's work by the author's kind permission, shows the appearance of an artery at this stage. The elastica interna of the old vessel is much swollen and stained yellow except in one part where it has not undergone vitreous degeneration and is still narrow and black. Internal to this is the new vessel-wall with the interarterial space between them filled with hyaline material.

Variations, according to the need of the new vessel, occur in this proceeding.

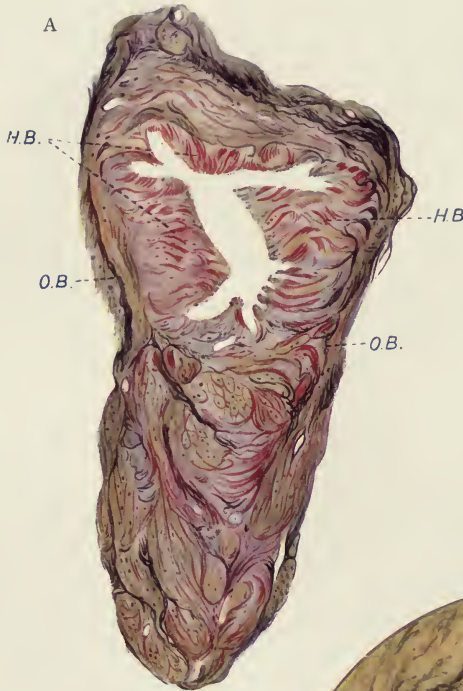
Very large vessels in the submucosa often have two or more new vessels formed within the old one, while in the vessels in the deeper parts of the uterus, which require only a slight diminution in the size of the lumen, a new intima and only part of a new media is formed, the remainder of the new media and adventitia being taken from the old vessel-wall.

When these new vessels are formed, the next important step in involution is the degeneration and absorption of the old vessel-walls. Extensive fatty degeneration occurs in the old vessel-wall, which, if involution is complete, entirely destroys the muscle-fibres of the old media while, at the same time, the degenerated elastic and fibrous tissue of the old media and adventitia is also absorbed. In this way, if involution is complete, the whole of the old wall is absorbed, and the new vessel is left without any trace of the old one surrounding it.

If the old *elastica interna*, which, as we have seen, has undergone, in the early stage of involution, vitreous degeneration, is not absorbed it undergoes what Goodall calls "vitreous hypertrophy"; in this stage the much swollen masses of degenerated elastic tissue regain their old staining and elastic properties, but retain the new bulk obtained in the degenerating process. If this occurs we find in the involuted uterus new vessels surrounded by masses of elastic tissue, the remains of the *elastica interna* of the old vessel, but now forming much thicker masses of tissue.

Figure B, Plate IV. and Figure A, Plate V. show the final result of subinvolution. Both these drawings are taken from a section of a uterus removed from a woman 37 years of age who had had seven children, the last four years previous to hysterectomy. During the last puerperium the uterus had not involuted completely, leaving the walls more than double the normal thickness, and the patient, during this time, had suffered from excessive bleeding and pain.

In Figure B, Plate IV. the new vessels are seen surrounded by a dense mass of elastic tissue, the remains of the *elastica interna* of the old vessels, while in Figure A, Plate V. the surrounding elastic tissue is interspersed with small amounts of muscular tissue; this is in reality the media of the old vessel-wall impregnated with large masses of elastic tissue produced by swelling of the elastic fibres in the media in the first stage of vitreous degeneration which, as they were not absorbed while in this stage, have undergone vitreous hypertrophy and regained their old physiological and staining properties. At the bottom of Figure B, Plate IV. a portion of a large vessel is seen to be composed very largely of an old vessel-wall; this is limited by a black line, the old *elastica interna*, internal to which is the new part of the new vessel-wall. The vessel-walls internal to the mass of black elastic tissue in both sections are completely new formed, and represent the amount of diminution which the lumen of the vessel



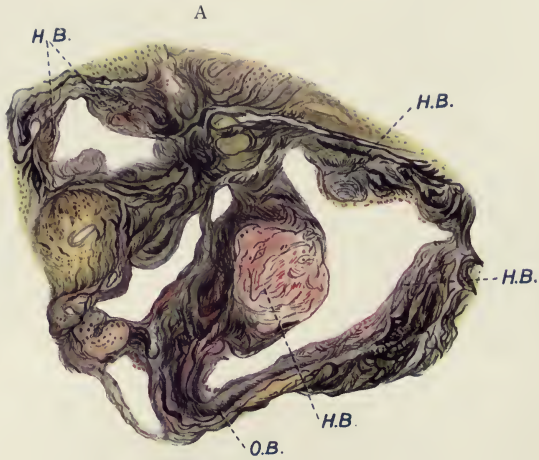
Section of a vein. The muscle-tissue has greatly multiplied and has replaced a great deal of the hyaline tissue (H.B.) O.B. denotes the old elastic boundary of the former large vessel. The vessel is cut somewhat diagonally, so that the lower portion of the drawing cuts the new wall of the vessel without touching the lumen. Note here the same hyaline substance between muscle-fibres.

Stains. Weigert, Hæmatoxylin and Van Gieson. (Goodall).

Vessels in a specimen of chronic metritis due to subinvolution. The large vessel in the centre of the drawing is entirely new, and is surrounded by a mass of black elastic tissue interspersed with muscle-fibres; this is derived from the elastica interna and the media of the old vessel, which has not been absorbed after undergoing vitreous degeneration, and has therefore undergone vitreous hypertrophy.

Stains. Weigert's elastic and Van Gieson.





Section of veins in which, owing to chronic tuberculosis, the hyaline bodies (H.B.) in the walls are being replaced by elastic tissue instead of by muscle.

O.B. denotes the boundary of the old vessels. (Goodall).



Vessels in a specimen of chronic metritis due to hypertrophy. These vessels are indistinguishable from those found in a virgin uterus, see Fig. B, Plate III. Note the very small amount of pink fibrous tissue.

Stains. Weigert and Van Gieson.

has undergone during involution. In normal involution all the old vessel-walls would have been absorbed, the new vessel-wall being the only part left.

In the veins there is no definite *elastica interna* but the walls are richly supplied with fibrous and elastic tissue. During involution the fibrous tissue forms a large hyaline mass which greatly constricts the lumen, and this hyaline mass eventually becomes invaded with muscle-cells and a varying amount of elastic tissue. In the large veins of the subplacental area the diminution in the calibre of the vessel is very great, necessitating the conversion of a large mass of hyaline tissue into muscle. At a later stage the outlying parts of this muscular pad form new muscle-bundles of the uterine wall, while the inner ones are arranged to form the new vein-wall. If involution does not progress well the hyaline tissue becomes converted into elastic instead of muscular tissue.

Figure A, Plate V. and Figure A, Plate VI. from Goodall's monograph show the sections of veins with their lumina much reduced by a mass of hyaline tissue which is being converted in the one case into muscle, in the other into elastic tissue. The remains of the old wall, bounded by streaks of elastic tissue, can be distinctly seen, and internal to this, is the mass of hyaline tissue being converted into muscular or elastic tissue.

Elastic and fibrous tissues in the wall of the uterus undergo the same changes as in the vessel-walls. They become much swollen and hyaline in character, and while in this condition the superfluous portions are absorbed. If involution is retarded, these masses are not absorbed and are gradually reconverted into fibrous and elastic tissue, so leaving a much larger proportion of these tissues in the myometrium than in a normal uterus. The endometrium is regenerated from the deep portions of this structure which are left after the removal of the superficial portion with the placenta and membranes.

If involution were perfect, it would be impossible to tell a parous from a virgin uterus; fatty degeneration would have reduced the muscular tissue of the large puerperal uterus to a normal amount, and would have removed all trace of the media of the old vessels within which new ones had been formed; elastic and fibrous tissue would have degenerated and the excess been absorbed. But involution is rarely, if ever, perfect; usually in some part of the uterine wall vessels will be found surrounded by elastic tissue, the remains of the *elastica interna* of the old vessel. Such a vessel is shown in Plate VII. This uterus was removed from a woman 27 years of age, who had had one child followed by a perfectly symptomless puerperium. The uterus was removed four years later, along with double ovarian cysts. But, though the puerperium was apparently normal and the uterus had involuted to

normal size, and the patient had subsequently a perfectly normal menstrual history, several islands of elastic tissue surrounding arteries can be found, and this is sufficient to prove previous parity. In this section a collection of elastic tissue is seen external to one of the arteries, while the remaining vessels are quite free.

Many conditions, however, occur to hinder involution—advancing age, frequent pregnancies, general, chronic, and acute diseases, local pelvic disease, retained pieces of placenta or membrane, and above all, septic infection, often so slight that the patient apparently has a normal puerperium with the exception that involution is retarded (see “Morbid Involution,” p. 153).

Now suppose any of these conditions have operated to delay or stop involution, what is the final condition of the uterus? Degeneration of the muscular tissue of the uterine wall has been arrested, causing the organ to be much larger than it should be. Fibrous and elastic tissue throughout the wall has degenerated and become swollen preparatory to being absorbed, but this process of absorption has been arrested, and these swollen fibrous and elastic fibres have gradually regained their normal functions and staining properties while retaining their increased bulk. For this reason, elastic and fibrous tissue is found in increased quantities between the muscle-bundles, especially in the outer third of the uterus, but these tissues only account for a small proportion of the total increase in size of the uterus as compared to the large proportion due to unabsorbed muscular tissue. The most noticeable change is in connection with the blood-vessels. New vessels have been formed, and, according to the amount of diminution required for each vessel, several new arteries, or one complete new artery, or only part of a new artery (the remaining part of whose wall will be made up of the inner part of the old wall) will be found within the old lumen. Early in the puerperium those new vessels were surrounded by the old vessel-wall which underwent changes preparatory to absorption, the *elastica interna* being enormously swollen, the fibrous and elastic fibres of the media swollen and hyaline. Owing to the arrest of involution this old wall was not absorbed, and the elastic and fibrous tissue regained their old properties and staining reaction, and so these new vessels, or groups of new vessels, will now be found surrounded by thick slabs of elastic tissue, and by the remains of the old media thickly impregnated with elastic tissue. Figure B, Plate IV. and Figure A, Plate V. are typical of the appearances of groups of vessels found in subinvolututed uteri.

At first the uterine wall is soft, but later the tissues become more and more compact, so making the uterus feel firm and hard.

In the walls of the veins much more elastic tissue will be found, especially in cases of subinvolution due to wasting diseases, as there is a tendency in these diseases



Vessels in a normal parous uterus. All these vessels are newly formed, and the remains of the old vessel-walls have been completely absorbed, except in the left bottom corner where two vessels retain some black elastic tissue outside their wall. This elastic tissue is the remains of the elastica interna of the old large vessel within which the two new ones were formed.

Stain. Weigert and Van Gieson.

for a less specialized tissue to replace a more highly specialized one; so in cases of subinvolution due to these diseases, the hyaline mass of the new vein-wall has been replaced more by elastic tissue than by muscle. Figure A, Plate VI. shows the hyaline mass being transformed into elastic tissue instead of muscular tissue as shown in Figure B, Plate V.

In some cases of subinvolution there have been alternating periods of involution and arrested involution; in these uteri arteries will be found with alternating rings of muscular and elastic tissue.

The endometrium is usually much thickened, in some specimens being as much as eight or nine times the normal thickness. The glands are often dilated and spiral in shape, sometimes markedly increased in number, but in many specimens this is not a marked feature. The stroma is usually of average density, but in some specimens it is much denser than normal, while in a few it shows signs of oedema, but this is usually in small areas, and not throughout the whole endometrium in any one specimen. The vessels often have thick walls, and many show a definite thickened *elastica interna*. On the other hand, many of these uteri have very little endometrium.

To summarize shortly the changes due to subinvolution: the uterus is symmetrically enlarged and hard; on a cut surface, the vessels with their surrounding elastic tissues are strikingly visible and stand out from the surface; the endometrium is usually thickened, but is often much diminished; microscopic sections show some increase in the amount of fibrous and elastic tissue between the muscle-fibres, but the most striking change is the large accumulation of elastic tissue around the arteries and groups of arteries. Until comparatively recently, investigators in this subject had only stained their sections with haematoxylin and eosin and Van Gieson stains, not with stains which differentiated the elastic tissue, consequently all this new-formed elastic tissue was looked upon as fibrous tissue. From this faulty histology the term "fibrosis uteri" was derived.

Owing to the changes we have described above, the amount of fibrous tissue is always slightly increased in a specimen of late subinvolution, and in some specimens it is more marked than in others. In some instances of subinvolution due to septic infection, this infection may have been sufficiently severe to cause a definite metritis, with a resultant increase in the total amount of fibrous tissue due to this cause, in addition to the amount produced by involution alone. From the examination of a large number of specimens I cannot convince myself that this does often occur, the specimens with matted appendages usually showing as little increase of fibrous tissue as those without any evidence of septic infection.

Another factor to be considered in studying the pathology of this subject is the change wrought in the uterus by advancing age. The uterus is present in a woman during the whole of her life, but unlike most other organs, it functionates only during a comparatively short period of her life, from puberty to the menopause. Before puberty the body of the uterus is very small and thin, being only about half the length of the cervix, and its walls contain a larger proportion of connective tissue than muscle, the proportions roughly being about *two* of muscle to *three* of connective tissue. At puberty the uterus rapidly grows until the body is twice the length of the cervix and much thicker and broader than in the infant. During this process the muscular tissue grows much more than the connective tissue, and in adult life the proportions of muscular and connective tissue are the reverse of those of infancy, being now *three* of muscle to *two* of connective tissue. During menstruation the increased amount of muscular tissue surrounding all the vessels exerts strong control upon the amount of blood which passes to the endometrium. Apart from the disturbing influence of pregnancy, this proportion of muscle to connective tissue is retained until near the menopause, which is the end of the uterus as a functionating organ. At this time menstruation ceases, and as there is no further need for the strong muscular control, the muscular tissue gradually atrophies and is replaced by connective tissue, the proportions returning to those of infancy though very often the process proceeds further until there is only a very small amount of muscular tissue to be found in the organ.

Owing to this change, a slightly larger proportion of fibrous tissue will sometimes be found in a uterus removed for subinvolution from a woman near the menopause, than in a similar uterus removed from a younger woman. This again is not a marked feature in the examination of a large series of specimens. The majority of these patients, with haemorrhage due to old subinvolution of the uterus, date the onset of the haemorrhage from a confinement, but a large number with the same microscopical appearances do not commence with excessive haemorrhage until many years after a confinement, that is until they are nearing the menopause. The explanation of this is the atrophy of uterine muscle which occurs at the menopause; before this time, although the vessels were surrounded by slabs of elastic tissue, the muscular tissue of these uteri has been so good that, in spite of the handicap of this elastic coating, an efficient control of the blood-vessels has been maintained. When near the menopause muscular atrophy occurs; the elastic tissue then prevents the attenuated muscle from controlling the flow and excessive haemorrhage results.

Quite apart from these senile changes, age prevents complete involution.

Neither muscle nor the degenerated fibrous and elastic tissues are so thoroughly absorbed in an elderly primipara as in a young one, so that it becomes the rule rather than the exception to find a somewhat enlarged uterus with increased fibrous and elastic tissues in an elderly primipara. In other words, in an elderly primipara it is the rule rather than the exception to find a slight degree of subinvolution. Another factor in producing these changes is multiparity. Even in a young primipara there is almost invariably some increase of elastic tissue found around the blood-vessels; in the next puerperium, still more remains unabsorbed, and as the number of pregnancies increase there is more and more unabsorbed elastic tissue left behind. The more rapid the pregnancies the less likely is the uterus to return to the normal condition.

Usually the endometrium is considerably thickened though in a few specimens it shows no increase or is markedly thinner. The glands may be increased in size and number or the proportions may be normal; the stroma may be of average, increased, or diminished density, but it is exceptional for it to be oedematous. In many specimens the arterioles of the endometrium possess a definite elastica interna, and their walls are considerably thickened.

Several authors have described cases of chronic metritis in which they ascribe the bleeding to arterio-sclerosis of the uterine vessels. Reinecke,¹ in 1896, reported four such cases, with bleeding about the menopause, in which he found arteries much thickened from a deposit of fibrous tissue in the tunica media. Findlay,² in 1905, published four cases of uterine bleeding with arterio-sclerosis, the thickening being due to a deposit of fibrous tissue in the tunica media and adventitia. He, however, considers this increase of fibrous tissue in the media of the arteries only as part of a general replacement of muscular tissue by fibrous tissue throughout the whole uterine wall, due to passive congestion. He ascribes the bleeding to this general fibrosis rather than to the arterio-sclerosis, though he looks upon the latter as a contributing factor, as the fibrous tissue stiffens the vessel-walls and prevents the lumen from being diminished by muscular contraction. None of these authors stained their sections for elastic tissue; if they had done so, they probably would have found that the thickening of the vessel-wall was due to increased elastic tissue rather than fibrous tissue, and that the change was in reality due to subinvolution as has been described above.

Frequently uteri at the commencement or end of reproductive life give rise to intractable haemorrhage without any increase in their size and in a few instances with their walls smaller than normal. Strictly speaking, these cases do not come

¹ See note 3, p. 118.

² See note 7, p. 118.

within the scope of this article, as one of the essential conditions in chronic metritis is symmetrical enlargement of the uterus. However, apart from this want of increase in bulk, many of the cases which occur about the menopause show the same microscopical changes as the class of subinvolved uteri. There is a large quantity of elastic tissue surrounding the arteries, and often a large amount also in the myometrium, and usually a slight increase in the amount of fibrous tissue in the myometrium. In fact these are uteri in which involution has progressed sufficiently far to absorb the superabundant muscular tissue, but has not affected the elastic tissue.

The cases occurring at puberty are quite another matter. In many of these the haemorrhage is due to a thickened endometrium, in others the muscular tissue is not sufficiently developed to control the blood-supply at the commencement of menstruation.

Opposed to the view that the chief change found in these uteri is a great increase in the amount of elastic tissue is the one held by Bukojemsky.¹ This author holds the entirely opposite view that there is a great decrease in the amount of elastic tissue, and that this decrease, by lessening the elasticity of the vessel-wall, prevents it from exercising its proper control over the amount of blood passing through its lumen. Apparently Bukojemsky has misunderstood the microscopic appearances, for the section he publishes shows an amount of elastic tissue very much in excess of that found in a virgin uterus, or in a nulliparous one which has undergone normal involution.

Schickele and Keller² do not believe that any histological change in the uterus produces this excessive bleeding but consider that it is due to some physiological process in the ovary. They argue that any change in the endometrium, or any increase in the amount of connective tissue cannot produce this symptom, but they do not seem to have examined their specimens for elastic tissue. They do not find any constant anatomical change in the ovaries in these cases, so fall back upon the hypothesis of a physiological change in the ovaries though they do not describe it.

Recently Beckwith Whitehouse³ has published some cases of chronic metritis which gave a positive Wassermann reaction, and concludes that the pathological changes in these uteri were due to syphilis. I⁴ have had one such case, but the patient dated her symptoms from her last confinement, and the microscopical appear-

¹ F. W. Bukojemsky, "Die Gebärmutterklerose (arteriosclerosis uteri) und deren Zusammenhang mit den Uterusblutungen," *Archiv f. Gynäk.*, 1913, vol. xcix. p. 463.

² Schickele and Keller, "Über die sogenannte chronische Metritis und die kleinstyistische Degeneration der Ovarien: ihre Beziehungen zu den Uterusblutungen," *Archiv f. Gynäk.*, 1911-12, vol. xciv. p. 609.

³ Beckwith Whitehouse, "Syphilis in Relation to Uterine Disease," *Roy. Soc. Med. (Sect. of Obst. and Gyn.)*, Jan. 1914.

⁴ See note 6, p. 119.

ances of this uterus were just the same as in an old subinvoluted uterus. It is probable that syphilis occurring in a patient with an old subinvoluted uterus may intensify the symptoms by producing peri- or end-arteritis, and in a nulliparous uterus may even produce the symptoms, but I do not know of any published case which proves this point.

III. Hypertrophy.—This is a very much smaller class than the subinvoluted uteri, but, except for the fact that it occurs in women who have never borne children, it gives the same symptoms and physical characters as the larger group. In the last 100 specimens of chronic metritis which I have examined only 4 fall into this group. Donald¹ has recently published a very marked specimen, and I have included the pathological investigation of his and three other specimens in a recent paper.² These uteri are usually from women near the menopause who have suffered from haemorrhage, pain, or leucorrhoea for a number of years, and often they have been curetted with temporary benefit; finally their symptoms have become so severe as to necessitate hysterectomy. The only physical sign is a symmetrically enlarged and firm uterus which may be either anteflexed or retroflexed, but is not fixed, nor are there any adhesions about the appendages nor any history of inflammation. Except that the woman is a virgin or nullipara the case is indistinguishable from the other classes previously described, and the uterus is removed with the diagnosis of chronic metritis.

The pathology of these specimens is, however, entirely different from that of the other groups. Like the others the uterine wall is very much thickened, Dr. Donald's specimen being $1\frac{1}{4}$ inches in thickness, but the most marked feature is the enormous thickness of the endometrium which in Dr. Donald's specimen measured 15 mm.

Figure 69 is a drawing of Dr. Donald's specimen. The walls are $1\frac{1}{4}$ inches thick, and the whole body of the uterus therefore more spherical in shape. This uterus was removed by supravaginal hysterectomy, so the cervix is not illustrated. The great thickness of the endometrium is well shown, and is not exaggerated as the drawing was done over a photograph.

Microscopically there is not the slightest similarity between these and subinvoluted or true chronic metritic uteri. Muscle and fibrous tissue occur in the same proportions as in a virgin uterus; blood-vessels are numerous, but their walls are not thickened, nor is there any elastic tissue surrounding them; elastic tissue exists only as the elastica interna of the arteries, and in small amounts in the vessel-walls and between the muscle-bundles of the myometrium. In fact, except for its great thickness the uterine wall is indistinguishable from that of a virgin uterus. The

¹ See note 5, p. 119.

² See note 6, p. 119.

increased bulk of the uterus is made up of muscular, fibrous, and elastic tissues, and blood-vessels in the same proportion as in a virgin uterus ; it is due to a hypertrophy of the whole of the uterine wall, and not to want of absorption as in the other class.

Figure B, Plate VI. is a drawing of part of a section from the specimen illustrated in Figure 69. When this is compared with Figure B, Plate III. from a section of a



FIG. 69.—Drawing of a specimen of chronic metritis due to "hypertrophy." Note the great thickness of the endometrium as well as of the uterine wall. This drawing is from a photograph.
(Dr. Donald's specimen.)

virgin uterus, it will be seen that there is practically no difference between the two, elastic tissue being represented chiefly by the elastica interna of the arteries. This is a very different picture from Figure A, Plate III. and Figure B, Plate IV. taken from uteri which were clinically indistinguishable from this one, but, histologically, are entirely different.

The endometrium is markedly thickened ; the glands may be enlarged and numerous or present no apparent changes ; the stroma may be of average density, or may exhibit patches of oedema, but these are not a marked feature. A glance at Figure 70, which compares a section through one wall of the uterus illustrated in

Figure 69 with a virgin uterus, shows the enormous increase in thickness which both the endometrium and the myometrium of this uterus have undergone.

The most probable explanation of these cases is a primary thickening of the endometrium, an adenoma. This thickened endometrium causes excessive haemorrhage, and so great is the increased thickness, especially about the menstrual period, when the endometrium becomes still further enormously thickened, that the uterus treats it as a foreign body, and endeavours to expel this, just as it would any other foreign body; the excessive uterine contraction so produced, manifests itself as severe dysmenorrhoea from which all these patients suffer. The dysmenorrhoea is so severe that the patient seeks medical advice and is usually curetted, followed, in the majority of cases, by a cure. If curetting is not performed, or if the adenomatous condition of the endometrium recurs in spite of further curetting, these excessive uterine contractions gradually lead to a work-hypertrophy of the uterine wall, as in all muscular organs after prolonged increase of work; hence as the patient advances in life the myometrium becomes thicker and thicker, though the constituent elements of the wall retain their original proportions. Curetting in this stage is seldom beneficial, and the only cure is hysterectomy. Curetting in the early stages generally cures the patients, hence the number who require hysterectomy is very small, and the patients who do require it are usually about the age of forty, as the hypertrophy is a slowly progressive condition, and it takes many years of excessive contraction to produce these thick walls. The cause of the haemorrhage in both the early and late stages is adenoma of the endometrium, but when once the uterine wall is much hypertrophied this condition always recurs after curetting; it is only in the early stages that a normal endometrium is reproduced after this operation.

The Origin of the Haemorrhage.—In “chronic metritis” and “subinvolution” the haemorrhage is, in all probability, due to the collection of fibrous and elastic tissue around the arteries, which prevents the muscular tissue of the uterus from exercising normal control over these vessels and regulating the amount of blood passing through them. In the “hypertrophic” variety the haemorrhage is probably due to changes in the endometrium, changes which may also be present in the other two varieties, though to what extent they produce or increase the haemorrhage in



FIG. 70.—Drawing from direct photographic print of a section through the whole wall of the specimen drawn in Fig. 69 (left) and a section through both walls of a virgin uterus (right). Note the great increase in thickness both of the endometrium and myometrium.

these cases we cannot at present be certain. The recent investigations of Beckwith Whitehouse¹ throw interesting and new light on this subject. When blood is poured into a tissue, as into the endometrium during menstruation, it comes into contact with a substance called "thrombokinase." "This substance," to quote from Whitehouse, "which varies in amount in different tissues, promotes the union of thrombogen and calcium salts to produce thrombin. The latter then exercises a quantitative action upon the fibrinogen, converting it into fibrin, the proteid which forms the organic basis of all clot."

"Thrombokinase" is especially plentiful in the endometrium, and is Nature's provision for checking excessive haemorrhage in an organ which is subject to periodic haemorrhages. The clot formed by the action of this "thrombokinase" blocks the vessels and, in a healthy endometrium, prevents excessive haemorrhage. If from any cause the "thrombokinase" is diminished in amount, clotting of the blood will be delayed, and there will be severe haemorrhage. Whitehouse considers this to be the cause of the excessive haemorrhage in uteri which have an atrophic endometrium, as this has not the power to produce the requisite amount of "thrombokinase." In addition to "thrombokinase" there is another substance produced in the endometrium, "thrombolysin," which has a marked effect on the production of haemorrhage. Owing to the action of "thrombokinase" clots are formed in the uterus, but in the menstrual blood found in the vagina in women with normal menstruation there are no clots; this is due to "thrombolysin," which has the power of dissolving blood-clot, and in a normal uterus dissolves the uterine clot formed by the "thrombokinase" before it reaches the vagina. In a normal uterus the amounts of "thrombokinase" and "thrombolysin" are balanced, clotting is produced by the "thrombokinase," and excessive haemorrhage checked, while later these clots are dissolved by the "thrombolysin" and the dark blood painlessly passed through the os. If the amount of "thrombolysin" is in excess the blood-clot will be too rapidly dissolved, and the blood-vessels again opened up, and excessive haemorrhage will be produced. Whitehouse considers this to be the cause of the excessive haemorrhage in uteri with hypertrophied endometrium as this produces an excessive amount of "thrombolysin." If these hypotheses are correct—and Whitehouse's experiments are very convincing—excessive uterine haemorrhage may be due to a diminished amount of "thrombokinase," or an excessive amount of "thrombolysin." How far this want of balance between these two substances accounts for the haemorrhage in "subinvolution" cannot yet be determined, but

¹ Beckwith Whitehouse, "Physiology and Pathology of Uterine Haemorrhage," *Hunterian Lecture*, Feb. 13, 1914.

possibly it is an additional cause in some of these cases, or increases the already excessive haemorrhage produced by the want of muscular control over the vessels. In the "hypertrophic" class, in which hypertrophied endometrium is the earliest and chief histological change, the excessive haemorrhage, if Whitehouse's hypothesis is correct, is due to the excessive formation of "thrombolsin." This is the only satisfactory explanation which has ever been given of the cause of haemorrhage in these cases.

DIAGNOSIS

The conditions which give similar symptoms and physical signs, and from which chronic metritis must be differentiated, are early pregnancy, small fibromyomata, carcinoma of the uterine body, and adenomyoma.

In pregnancy there is usually a period of amenorrhoea, but in the first two or three months this is not necessarily so. A patient with chronic metritis who has recently become pregnant will often give a history of menorrhagia with no period of amenorrhoea, though close questioning may reveal the fact that the last period was not so profuse as the previous one. A two months' pregnant uterus is about the size of a chronic metritic uterus, but is much softer in consistence; moreover, it is more globular in shape, and is usually in the position of exaggerated anteflexion, though in a few cases it is found retroflexed. Generally, even in this early stage of pregnancy, there is some softening of the cervix, increased secretion of the vagina, and increased pulsation in the vaginal fornices. In cases of doubt it is better to defer a definite diagnosis for a month, when there is usually no difficulty in arriving at a correct diagnosis. Abderhalden's test should be useful in these doubtful cases, but it is not sufficiently exact at present for diagnostic purposes.

A small interstitial fibromyoma presents great difficulties in diagnosis, and it is often quite impossible to differentiate between these two conditions. Any irregularity in the contour of the uterus points to a fibromyoma. The passage of a sound to define the course of the uterine canal and the position of the fundus, with careful bi-manual examination under anaesthesia, will often reveal the presence of a small fibromyoma of the anterior or posterior uterine walls which otherwise would have been overlooked. A fibroid polypus also should be detected with the use of the sound, but the fact must be emphasized that the sound must be used only with the strictest asepsis, and not in routine consulting-room examinations.

Figure 71 shows a bisected uterus with a small interstitial fibromyoma in one of its walls, but the whole contour of the uterus is so regular that it was impossible to make a correct diagnosis before bisecting the organ after hysterectomy.

The diagnosis between these conditions is not usually of any great importance, but to distinguish between chronic metritis and carcinoma is of the very greatest importance.



FIG. 71.—Drawing of a bisected uterus containing a small fibromyoma. Until this specimen was bisected it was impossible to distinguish it from one of chronic metritis.

With haemorrhage about the menopause it is often difficult to determine whether it is due to chronic metritis or to carcinoma of the body of the uterus. Continuous slight bleeding, with foul-smelling discharge, and constant, increasing pain are all in favour of the diagnosis of malignancy. The only sure way of clearing up the diagnosis is to dilate the cervix and curette the interior of the uterus; this must be done very carefully and thoroughly or an early patch of carcinoma may be overlooked.

Adenomyoma produces haemorrhage in a regularly enlarged uterus, and is usually indistinguishable from chronic metritis; it is a comparatively rare condition, and the failure to differentiate between these two conditions is usually of no moment.

TREATMENT

The treatment of chronic metritis may be prophylactic, palliative, or curative.

Prophylactic.—To prevent the occurrence of chronic metritis the most rigid asepsis is necessary during labour and miscarriage, for sepsis not only causes true chronic metritis, but is a most important factor in producing subinvolution. Sepsis, too slight to cause definite acute symptoms, is still sufficient to prevent normal involution, and this is especially the case after miscarriage, as patients, especially of the poorer classes, often pay very slight attention to this mishap, and do not undergo any treatment, nor

do they even rest. Cases of chronic metritis following infection, apart from the puerperium, are rare, but all cases of acute infection, generally gonorrhoea, must be thoroughly treated, and the patient kept at rest until all effects have subsided.

Care must be taken with the third stage of labour to ensure the complete removal of the placenta and membranes, and incomplete abortions must be completed by the aid of the blunt curette. If a uterus is slow in involuting, ergot should be administered, and the patient forbidden to resume her ordinary duties too soon. In no case should a patient be allowed to rise until three weeks after labour. Strict attention must also be given to the bladder and rectum to ensure of these being regularly emptied (see "Morbid Involution," p. 153).

When subinvolution has become chronic, that is to say when the patient has the symptoms and signs of chronic metritis dating from a confinement, it has been stated that the best means of cure is another pregnancy followed by a carefully supervised puerperium, but this is by no means always efficacious.

Palliative and Curative.—Apart from this much can be done to alleviate and diminish the symptoms. Rest is the most important factor, especially at the menstrual periods. The patient should, if possible, be kept in bed during menstruation, and in the intervals compelled to rest on a sofa for two hours each afternoon. This in itself often works wonders, especially with young mothers borne down with the weight of new-found cares during the first years of motherhood, in whom the uterus has never been given a chance to involute completely. A certain amount of exercise, not sufficient to over-tire the patient, should be taken daily except during menstruation.

Of equal importance is daily free movement of the bowels. With constipation, from which so many of these patients suffer, the loaded rectum retards the pelvic circulation and prevents the withdrawal of waste products from the uterus. Magnesium sulphate is one of the best drugs for this purpose, except in early cases of subinvolution when the patient is suckling her child. Iron is a useful drug for these cases, and, combined with magnesium sulphate, forms one of the most generally used mixtures. Hot douching is also valuable, especially in those cases complicated by adhesions. Any weak antiseptic may be used, boracic acid being the best as it is non-irritating, but the important points, to which little attention is usually given, are that the douche must be hot, as near 120° F. as the patient can bear; that it must be of long duration, at least one gallon being used; and that it must be given in the recumbent position. Ergot and liquid hydrastis canadensis are valuable by encouraging uterine contractions, but their chief value is in the puerperium and in those cases which suffer from menorrhagia. Rest, hot douching,

free purgation, and ergot or hydrastis will cure many of the slighter cases, especially in the first year after labour; and in other cases, while not effecting a cure, will diminish symptoms and make life bearable. Spa-treatment, especially that carried out at Woodhall Spa in England, is often recommended for chronic metritis, but the benefit derived therefrom is due to the regular life, rest, and douching.

Calcium lactate has been advocated for the treatment of excessive haemorrhage by Blair Bell¹ and is sometimes of service. It should be given in gr. xxx doses on alternate nights. If there is any syphilitic taint a three months' course of mercury and potassium iodide should be given.

Uterine massage has been recommended by a Swedish teacher of gymnastics, and practised by specialists on the Continent; this consists in pressing up the uterus with one or two fingers in the vagina and rubbing it for ten or twenty minutes daily with the other hand on the abdomen. The treatment is one which recommends itself to neither patient nor physician. I know of no evidence that it is beneficial, and have no experience of it myself.

Attention must also be given to the general health. Many of these patients are much reduced by the excessive loss of blood; owing to this and the introspective attitude of mind due to chronic illness, the large majority of them are in a state of nervous debility, and it is this which causes many to complain of symptoms which in ordinary health they would not worry about. The digestion must receive attention, and a generous but easily digested diet prescribed. Tonics, iron, phosphates, and strychnine are useful, and the bowels must be made to act regularly, magnesium sulphate being the best drug for this purpose. Regular hours and freedom from worry are essential to cure, and it is for this reason that Spa-treatment is sometimes of value. Except in cases of severe debility the patient should have some employment or recreation to occupy her mind. Nothing is worse for this class of patient than to allow "her mind to dwell on her pelvis." Alcohol is detrimental rather than beneficial, but a little with meals sometimes aids digestion.

Curetting is often of great value in chronic metritis,² the benefit being due to the removal of the thickened endometrium which occurs in so many of these cases, and to the direct stimulation of the uterine wall with the curette; at the end of this simple operation the uterine wall has usually contracted so much as to grip the curette. Many authors deny the good results obtained by the simple procedure of curetting, and use the instrument only as an aid to diagnosis. Perfunctory scratching of the endometrium is quite useless; the operation must be done carefully

¹ W. Blair Bell, *The Principles of Gynaecology*, 1910.

² Shaw and Donald, "The Symptoms and Treatment of Chronic Endometritis with Special Reference to the Results of Curetting," *Roy. Soc. Med. (Obst. Sect.)*, 1911, vol. iv. p. 37.

and thoroughly so as to remove the whole of the endometrium, which many operators believe to be impossible, but which is possible, as I have examined several uteri in which a preliminary curettage preceded the hysterectomy, and found the whole of the endometrium had been removed. In many cases curettage gives no benefit, and in others the symptoms soon recur, but so many of these cases are permanently benefited that very few cases of chronic metritis should be subjected to hysterectomy until a thorough curettage has been given a sufficient trial. Carried out carefully by a competent operator there is no risk in the operation, and the inconvenience to the patient is more than made up for by the chance it gives of saving her uterus. After an experience extending to some thousands of cases curetted while I have been attached to St. Mary's Hospital, I have never seen one bad result in hospital, though I have seen a few appalling cases done outside without due heed to rigid asepsis. A word of warning is necessary never to curette if there is any infection of the appendages. Curettage is of special value in the early stages of the "hypertrophic" variety of chronic metritis.

With chronic metritis the cervix is often much enlarged by chronic cervicitis, and it is of great benefit, when curetting such a case, to amputate the cervix, especially when leucorrhoea is a prominent symptom. The chronic aching pain which accompanies chronic metritis is due in a large measure to the heavy uterus dragging on its ligaments, and this is made worse by the laxity of the pelvic floor which accompanies so many of these cases.

In addition to curettage and amputation of the cervix it is often of great benefit to the patient to perform a double colporrhaphy, though, strictly speaking, this operation has no effect on the chronic metritis, but cures, or lessens the pain, by diminishing the "drag" of the heavy uterus.

At one time atmocautery was advised for cases of excessive haemorrhage, but it is now rarely, if ever, used in this country. By this method superheated steam was introduced into the cavity of the uterus for a short period, fifteen to thirty seconds; this destroyed the tissues to a certain depth which subsequently came away in small sloughs. The great difficulty was to regulate the application so that only the superficial tissues sloughed, and cases are recorded of necrosis of the whole mucous membrane, obliteration of the uterine cavity, perforation of the uterus and pelvic inflammation. At the best its effect was only equal to that of thorough curetting.

Radical.—If these methods of treatment fail—and they do in a large number of cases—some operation must be performed for total or partial removal of the uterus.

Howard Kelly¹ has devised an operation which he calls "vertical resection," while Victor Bonney² names the same operation "utriculoplasty." In this operation the abdomen is opened and a wedge-shaped portion of the uterus removed, the base of the wedge being at the fundus, and the two sides of the uterus are then sutured together. In this way the organ is much reduced in size, and several authors have published cases with good results, pregnancy even following in some cases. It is claimed for this operation that the excessive bleeding is cured, but that the uterus will still menstruate normally, and that the patient may become pregnant; against it must be put the fact that the patient may not be cured and may require a second abdominal operation.

I have not any personal experience of the operation, but it does appear to be of service in the somewhat small number of cases where the patient is young, and where she expresses a strong objection to the total removal of the uterus. The number of cases on which it can be performed is small, as so many of these young patients have suffered from severe inflammation, and both appendages are so matted as to require removal, in which case it is better to do a complete radical operation and remove the uterus with the appendages. For this reason many of these uteri are removed by the abdominal route, either with a complete panhysterectomy or, as is more usual, by the supravaginal method (see Vol. III. p. 471). If there is no matting of the appendages the uterus is generally removed by vaginal hysterectomy. For the detailed method of performing this operation see Vol. III. p. 459. This method is preferable to abdominal hysterectomy, as there is less shock to the patient and no abdominal scar. It is easy to perform because the incision can be made close to the cervix, there being no necessity to leave a large margin as in carcinoma of the cervix.

In order to avoid weakening the pelvic floor and altering the shape of the vagina, Wallace³ advocated "vaginal subtotal hysterectomy." In this operation he made a transverse incision in front of the cervix, pushed up the bladder, opened the uterovesical pouch of peritoneum, and delivered the fundus uteri through this opening. After stitching the anterior flap of peritoneum to the posterior wall of the cervix and across the broad ligaments, he removed the body of the uterus by cutting down the broad ligaments and across the top of the cervix, suturing the broad ligaments and stitching together the raw surface of the cervix. The operation was completed

¹ Howard Kelly, "Amputation of the Corpus to preserve the Menstrual Function," *Trans. Amer. Gynaec. Soc.*, 1909.

² Victor Bonney, *Lancet*, May 13, 1911, p. 1266, "Six Cases of Utriculoplasty for Uterine Haemorrhage, one of which was followed by Pregnancy and Labour."

³ Arthur J. Wallace, "Vaginal Subtotal Hysterectomy," *Journ. of Obst. and Gyn. of the Brit. Empire*, 1910, vol. xviii. p. 269.

by suturing the first vaginal incision. In this way he removed the body of the uterus without making an abdominal incision, while he preserved the cervix and made no alteration in the pelvic floor or in the shape of the vagina.

Within recent years radium¹ and X-ray treatment has been advocated as an alternative to hysterectomy. At present this method of treatment is only in the preliminary experimental stages, but cases have been published in which it does seem to have been of benefit. There seems to be considerable difference of opinion as to whether the benefit is derived from the action of the rays on the ovaries, endometrium, or the uterine wall itself.

To summarize the treatment. In the earlier, milder cases, make the patient rest and free her from worry, if possible send her away from household anxieties; keep her bowels regular; give hot vaginal douches and improve her general health with diet and tonics; also administer iron, ergot, and hydrastis canadensis. If this fails, or in more severe cases, curette the uterus and, if necessary, amputate the cervix and do a double colporrhaphy, followed by rest, diet, tonics, ergot and hydrastis and aperients. If, in spite of this the symptoms continue or recur, it will be necessary to remove the whole or part of the uterus.

¹ Cuthbert Lockyer, "The Future of Radiology in Gynaecological Practice," *Journ. of Obst. and Gyn. of the Brit. Empire*, 1914, vol. xxvi. p. 92.

MORBID INVOLUTION

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By reason of its frequency morbid involution of the uterus occupies an important place among the diseases of the pelvic organs in women. Though frequently recognized as the direct or indirect cause of many uterine and pelvic disorders, it is probably much more common than can be clinically determined. The clinical recognition of subinvolution of the uterus rests chiefly on the persistence of more or less uterine enlargement after the termination of pregnancy, but well-marked structural changes may exist in the uterine wall not only without symptoms, but without any appreciable alteration in the size of the uterus. The condition has then no gynaecological significance, but it may have an important influence on future pregnancies. The substitution of connective tissue for muscle, the diminution in the elastic tissue, or the impaired retractility of imperfectly formed elastic fibres will interfere not only with the uterine contractions during labour but with subsequent contraction and retraction. Imperfect involution is, in many cases, the cause of *post-partum* haemorrhage in women who have had many pregnancies.

Involution means the process by which the pelvic organs are restored to their normal unimpregnated condition after the completion of pregnancy, whether at term or prematurely. *Subinvolution* means an arrest of, or interference with, this process. As usually employed, the term involution is limited to the changes in the uterus, but strictly it should include the retrogressive changes that take place in all those structures that undergo hypertrophy during pregnancy. Many of the symptoms clinically associated with subinvolution are the result not so much of the increased size of the uterus or the pathological changes in its wall, as of the incomplete involution of the uterine ligaments and the vagina.

Normal Involution.—To appreciate the nature and causes of subinvolution it is necessary to consider how the decrease in the size of the uterus is normally brought

about. The gradual diminution in size may be noted clinically; the nature of the changes by which this diminution is effected must be determined microscopically and chemically.

In the first ten or twelve days after labour, the steady decrease in the size of the uterus can be ascertained by abdominal palpation. After the twelfth day it can be determined only by bi-manual examination. In estimating the rate of involution in the early days of the puerperium it is usual to rely on the height of the fundus above the pubes. There are possible sources of error attaching to this method, but clinically it is the most readily employed and the most satisfactory. The position of the fundus on particular days has been variously estimated by different observers, but need not be considered here. The rapidity with which involution takes place will be better appreciated by noting the rapid loss of weight. On the completion of labour the uterus, according to Whitridge Williams, weighs about 1000 grammes. By the end of the first week its weight is reduced by half, while by the end of the second week it weighs 375 grammes, and at the end of the sixth week only 60 grammes. On these clinical facts observers are for the most part agreed. It will be noted that in the first week the loss of weight is rapid, and after that time more gradual—a fact attributed by Longridge to a partial restoration of the uterine circulation.

By what means is this rapid diminution effected? To the elucidation of this question much study and investigation have been given, but it must be admitted that the precise nature of the changes that take place is still a matter of doubt. Opinions have been based largely on microscopic examination, chiefly too of specimens that were undoubtedly pathological.

Changes in the Muscular Fibres.—Till comparatively recently it was generally accepted that the muscle-fibres of the puerperal uterus underwent fatty degeneration, and that this was the chief means for bringing about its involution, but there was a wide difference of opinion as to the extent of these fatty changes. Heschl, for example, held that the individual muscle-fibres were completely destroyed and were replaced by new fibres only after destruction of the old was complete. Luschka, on the other hand, believed that no fibres were completely destroyed—that the individual fibres merely underwent fatty degeneration and reduction to their normal unimpregnated size. Kölliker and others took an intermediate position maintaining that, while reduction in the size of the fibres was the chief factor in the diminution of the uterus, many fibres did actually disappear. Säger,¹ after long and careful investigation of the subject, came to the conclusion that as the result of contraction and retraction and consequent anaemia of the uterus, the protoplasm of the muscle-

¹ *Die Rückbildung der Muscularis des puerperalen Uterus*, Leipzig, 1888.

cells underwent granular, cloudy, hyaline, and fatty degeneration. With the absorption of these degenerated products the muscle-fibres gradually returned to their original size, but no single muscle-fibre was necessarily destroyed.

Although there were differences of opinion as to the extent to which the process was carried, the view that fatty degeneration was the chief factor in involution was held without question till the results of Helme's researches¹ were published in 1888. Helme studied the process in the rabbit, and at all stages in the process of involution. He thus had the opportunity of studying involution as it takes place normally, undisturbed by pathological conditions always in some degree present when the changes in the involuting human uterus are the subject of investigation. His results thus "far outweigh the few and imperfect observations quoted in support of the text-book account" (Herman²). Helme found atrophy, but no fatty degeneration: no fat-globules were anywhere apparent. This atrophy affects muscle and connective tissue uniformly and alike. The cells of both undergo a chemical change, regarded by Helme as a sort of peptonization, which renders part of the contents of the cells soluble and capable of absorption. He found no evidence of a destruction of old fibres or of the formation of new, merely a gradual diminution in the size of existing fibres.

Helme's findings were at once accepted as the correct explanation of the changes that lead to involution of the uterus, but more recently the view that there does occur fatty degeneration of the uterine muscle, with complete destruction and disappearance of some of the fibres, has been revived. Goodall,³ in an elaborate investigation into the vascular changes in the uterus during pregnancy and the puerperium, incidentally notes that he found definite evidence of fatty degeneration, and more particularly in the muscular coat of the vessels. In his final conclusions he states that "the muscular walls of the uterus and cervix undergo fatty degeneration with subsequent slow absorption of the fat." Goodall's observations differ in another respect from those of Helme. He found that the process of involution was not uniform throughout the uterus but was met with at different stages in different areas. This may be the result in part of pathological conditions, but Goodall regards it as due to the unequal pressure of the uterine muscle-fibres.

Changes in Connective Tissue and Blood-Vessels.—Observations on the changes in the wall of the uterus during involution have been directed chiefly to the musculature, but almost equally important changes take place in the connective tissue and blood-vessels. The connective tissue diminishes in amount *pari passu* with the other

¹ *Transactions, Royal Society Edin.* vol. xxxv. Pt. ii. No. 8.

² *Diseases of Women*, p. 86.

³ "The Involution of the Puerperal Uterus," *Amer. Journ. of Obstetrics*, vol. lx. No. 6.

hypertrophied tissues of the uterine wall. An increase of connective tissue was at one time believed to take place *post partum* and to play an important part in the subsequent shrinkage of the uterus. But in normal conditions this is not the case. Helme found neither increase in the amount nor any development from an immature to a more mature state. The process begins as an increased granularity of the connective-tissue fibres and cells. Some of the fibres swell up and become hyaline, but ultimately they become granular and are absorbed. Goodall thinks that in all cases the connective tissue undergoes hyaline degeneration and becomes absorbed. Both agree that fatty degeneration plays no part in the process of reduction. In normal involution the balance of muscle and fibrous tissue is restored, but in unfavourable conditions connective tissue may remain in excess and interfere with the regeneration of the muscular constituents. In morbid involution there may be an increased formation of fibrous and elastic tissue with a corresponding diminution in the muscle-fibres. The effect of this on subsequent parturition will be obvious.

The blood-vessels undergo definite and striking changes which have recently been carefully studied by Goodall. The hypertrophied vessels are gradually reduced in size; their walls participate in the general atrophy, but according to John Williams¹ the arteries appear to be affected by the retrogressive process to a less degree than the tissues of the uterine wall generally. He found the connective tissue around the arteries increased in quantity and the arterial wall greatly thickened. A section through a completely involuted uterus shows the arteries to project beyond the surrounding surface and to present thick, yellowish-white walls. Williams regarded this condition of the arteries as the strongest presumptive evidence of partity we possess, but the researches of Goodall make it probable that the condition described by Williams is not physiological but the result of some disturbance of normal involution. Goodall, whose observations were directed chiefly to the changes in the uterine vessels, examined a large number of uteri at various stages of involution and after the process was completed. A detailed description of his findings is impossible here, but his general conclusions may be shortly stated. "The uterus renews all its arteries after each pregnancy." This renewal always consists in the building of a new vessel within the lumen of the old. Where a vessel has to undergo great reduction in size, as in the case of the hypertrophied vessels that supply the placenta, the new vessel will have three completely new coats. In the case of a vessel which has to reduce its calibre but slightly, the new vessel will build for itself a new intima and incorporate as much of the media of the old vessel as is required to complete its wall. In normal cases, the walls of the old vessel which have become superfluous

¹ "On some of the Changes in the Uterus resulting from Gestation," *Trans. Obstet. Soc. Lond.* vol. xx.

slowly undergo destructive changes and are completely absorbed ; but under unfavourable conditions the destruction and absorption may be very incomplete, and this result is very common in multiparous women and in elderly primiparae. In a young woman in healthy condition, on the other hand, the parous uterus can return to a condition so closely resembling the virgin uterus (microscopically) as to be indistinguishable from it. The sinuses in the uterine wall are invaded by fibrous tissue which normally is largely absorbed, but it may remain long unabsorbed, and its presence is, in Goodall's opinion, the most positive sign of a foregoing pregnancy.

There is, as will be seen, still room for doubt as to the intimate changes that take place in the various constituents of the uterine wall during normal involution. From a practical point of view, however, it is of greater importance to determine the uterine and pelvic conditions which favour the occurrence of these changes. It has long been held that the chief factors in promoting involution are contraction and retraction, which arrest or retard the circulation of the uterus and so interfere with the nutrition of the muscular and other elements of its wall, and lead to atrophy. Goodall, however, while admitting that the destructive changes preparatory to absorption are more complete the more rapid the reduction in the size of the uterus, is not convinced that a direct dependence exists between uterine contraction and retraction on the one hand, and degenerative changes and absorption on the other. He points to the similarity of the changes in atrophy of a corpus luteum, where there are no contractions, as at least suggesting that uterine contraction and retraction need not play any part in the causation or rapidity of tissue change. Moreover, it is difficult to believe that by a mere interference with nutrition the hypertrophy of months could be so rapidly undone ; that in one week the uterus could lose half its weight. It is now agreed that chemical changes take place, that the hypertrophied tissues undergo an autolytic process, that part of the protoplasm of the tissue-cells is rendered soluble and absorbed. By what means this is effected we do not know, but Longridge¹ has advanced a plausible explanation based partly on an application of the known facts of autolysis to the process of involution, and partly on definite experimental results. It is the sole explanation that, in his opinion, meets the facts.

His view can be stated only shortly. The contractions of the uterus in labour lead to the development of sarcolactic acid in the uterine wall. This acid is neutralized by the circulating blood till the uterus contracts down after the expulsion of its contents. By contraction and retraction the circulation through the uterus is

¹ "Excretion of Creatinin in Lying-in Women, with some Remarks on Involution of the Uterus," *Journ. of Obstet. and Gynaecol.* vol. xiii, p. 420; and "The Blood-Tight Uterus and its Influence on Involution," *Brit. Med. Journ.*, 1909, ii, p. 1459.

arrested. The uterus is now in a condition of anaemia and of reduced alkalinity, two factors which favour rapid autolysis. He confesses that he had no opportunity of testing the acidity of a normal involuting uterus, but a uterus removed by the Porro-Caesarean operation was found to give a distinctly acid reaction thirty-six hours after removal. During the first few days of the puerperium, he believes that the uterine circulation is almost completely arrested, but that later, as the result of softening of the uterine wall, blood begins to percolate more freely through the organ. The partial restoration of the circulation diminishes the acidity, or renders the tissues alkaline, and the rate of autolysis is lessened. At the same time it permits of the removal of tissue already rendered soluble. This conception of uterine involution was suggested to Longridge by his researches into the nitrogen excretion during the puerperium. From the fifth day after labour he found in all cases a large increase in the total nitrogen excreted. Whether right or not, Longridge's explanation certainly accords with the clinical fact that involution is much more rapid during the first week of the puerperium than subsequently.

The explanation of the phenomena of involution must be left at this point. Clinical and microscopic observations will probably carry us no further. It is to biochemical researches that we must look for further advances.

SUBINVOLUTION

Causes of Subinvolution.—The uncertainty as to the true nature and causes of involution leads to a corresponding uncertainty as to the causes which interfere with its normal course. Many conditions are believed to interfere with involution, but of some of these at least it is doubtful whether and to what extent they affect either the rate or completeness of the process.

For perfect involution the woman must be in good health during the lying-in period. Ill-health, local or general disease, and even age, all tend to weaken "the unknown force, whether uterine contraction or other," which brings about the destructive and regenerative changes in the uterus. Goodall summarizes the causes as those "which operating locally or generally reduce the regenerative power of the tissues and the absorptive power of the body." Hence, age and multiparity are potent factors. All chronic and acute diseases, by disturbing the natural metabolism, retard or render imperfect the process of involution, and where chronic or acute disease affects the pelvic organs there is added the disturbing effect on the local circulation. The absence of effective contraction and retraction has always been held to be a powerful factor in hindering involution. According to Longridge, complete retraction is essential to normal involution. Goodall, on the other hand, is

unable to satisfy himself of the dependence of the process on contraction and retraction, but clinical observation tends to support the general view. Hence the occurrence of subinvolution will be favoured by anything that interferes with efficient contraction or retraction such as over-distension of the uterus from hydramnios or multiple pregnancy, or a deficiency of calcium salts in the blood. One of the most common causes of imperfect retraction is the retention of a portion of membranes or placenta, which is invariably associated with retarded involution. The most marked case of subinvolution which the writer has seen was the result of a mechanical interference with retraction. At the end of the second month the fundus was still within an inch of the umbilicus, while the sound passed over four and a half inches. Over the fundus, and reaching almost to the liver, there was an irregular somewhat tender mass. On opening the abdomen, the right tube and ovary along with the appendix were found matted together, adherent to the fundus, to the parietal peritoneum, and to the under surface of the liver.

John Williams¹ analysed the causes of subinvolution in a series of 104 cases which were carefully observed. One-half of the cases were primiparous women. In the 52 multiparae, involution proceeded normally in 50, at any rate so far as could be determined by the usual clinical standards, and notwithstanding the fact that 7 had a temperature of 102° or higher, for six or more days, and 6 had laceration of the perineum. Both the cases in which the uterus did not sink into the pelvis till the fourteenth day were febrile, but neither had perineal tearing. Of the 52 primiparae there was clinical evidence of subinvolution in 12; and the chief factors leading to subinvolution seemed to be puerperal pyrexia, retention of membranes or placenta, laceration of the perineum, and *post-partum* haemorrhage. Lacerations of the cervix did not apparently influence the rate of involution.

Besides these there are other alleged causes of subinvolution: general debility, advanced age, multiparity, protracted labour, displacements of the uterus, and not suckling. On a *priori* grounds it is probable that ill-health retards involution; the uterus, as other tissues, suffers, and the process is retarded. Age operates in much the same way, the bodily activities are slower, and tissue-change is more slowly and less completely carried out. Protracted labour has been assigned as a cause of subinvolution, but experience does not bear this out. It is the exception to find any retardation of the process after a prolonged or difficult labour. Where it does occur, it is due more probably to injury or infection than to mere prolongation. Displacements of the uterus and over-exertion during the puerperal period, if they retard involution, do so through their influence on the uterine circulation. Suckling

¹ "Remarks on Subinvolution of the Uterus," *Brit. Med. Journ.*, 1882, pt. ii. p. 405.

has generally been held to have a favourable influence on involution, but Serdukoff¹ states that for the first four days the process goes on faster in those who do not nurse, while, after this period, it is more rapid in nursing women. Milsom, on the other hand, maintains that nursing has the effect of retarding involution, but this is contrary to clinical observation. Blair Bell attributes the tendency to subinvolution in women who do not nurse to a deficiency in the calcium-content of the blood. Inability to nurse and retarded involution are in his opinion due to a common cause. Acute puerperal infections probably affect the completeness if not the rate of involution, but on this point there is considerable difference of opinion. Both Spiegelberg and Heschl agree that they do not check the process to any appreciable degree, and certainly it is the rule in acute general infections, where there is little local inflammation, to find involution advancing at the normal rate, but whether the process is in other respects normal, whether involution is perfect, it is impossible to say.

Of the various causes of morbid involution the most common and the most potent are the retention of portions of membranes or placenta, uterine or pelvic inflammation, advanced age, and multiparity. All tend to retard the process, but whether they leave any ultimate or permanent change in the constituents of the uterine wall, though this is probable, cannot meantime be stated with certainty. A case examined by Goodall seems to indicate that morbid changes may persist for a long time after involution is apparently complete. Although the uterus was reduced in size to the extent of hyperinvolution, microscopic examination revealed the presence of an abnormal amount of unoxidized tissue.

Morbid Anatomy of Subinvolution.—In the earlier stages, where involution is merely interrupted or delayed, microscopic examination will reveal few, if any, changes other than those that accompany normal involution. There is no more than a retardation of the process which may be purely temporary. The histological findings are merely those of an earlier period of involution. In morbid involution, however, Goodall noted that the changes were less uniform. In some parts of the uterus, the process appears to proceed rapidly and normally, in other parts it lags, and there remains an excessive amount of tissue unabsorbed. There is an irregular degeneration and regeneration of tissue, and that this irregularity is the result of pathological causes seems likely from the observations of Helme on physiological uteri, in which he found that degeneration and absorption took place uniformly throughout the uterus. The effect is that, in those areas where oxidation and absorption are arrested, there is an increase of fibrous and elastic tissue at the expense of the more highly developed muscular tissue. There are an increased destruction of

¹ *Edin. Med. Journ.*, 1875, pt. i. p. 965.

muscle-fibres and a stimulation of the lower types, namely fibrous and elastic tissue, and more particularly the latter. The earliest evidences of imperfect involution are, then, an increase in unoxidized products and an undue amount of hyaline tissue scattered irregularly throughout the uterus. Later, the fibrous and elastic tissues undergo hypertrophy and compress the muscle-fibres, thereby still further interfering with their normal regeneration. Sections of the uterine wall at this stage would show an undue preponderance of either fibrous or elastic tissue, or of both, while the muscular tissue would show an absolute, as well as a relative diminution, and many of the existing fibres would be softer and less healthy than normal. The uterus, though usually enlarged, is not necessarily so. It will be large or not, according to the hypertrophy of the connective tissue. At first the organ is soft and lacking in tonicity; later, when the fibrous tissue becomes organized, it may be hard and brittle.

In subinvolution the arteries of the uterus show characteristic changes: there is an increase of connective tissue in their walls which are greatly thickened; there is an hypertrophy of the intima which closely resembles that found in arterio-sclerosis; and hence it may be conjectured that the arterio-sclerosis of the uterine arteries which is found about the time of the menopause, and chiefly in women who have borne children, is in many cases the result of imperfect involution. According to Goodall, there is a strong tendency, in morbid involution, for the remains of the walls of the old hypertrophied vessels to be retained unabsorbed. When involution is irregular, the process is subject to periods of arrest, and during these periods regenerative changes take place, followed, when the block is removed, by destructive changes. If these periods are of sufficiently long duration, the effect on the uterus, Goodall thinks, is that of several successive involutions. "The uterus will then show in its vessels, not a single step from the large vessel of pregnancy to the small vessel of complete involution, but a series of vessels lying one within the other."

The condition of the uterus in subinvolution is in many respects similar to that in chronic metritis, but it differs from the latter in that the changes are not inflammatory in nature but the result, primarily at any rate, of a delayed physiological process. But the subinvoltuted uterus is liable to become the seat of inflammatory changes, and hence in the terminal stages it will often be impossible to distinguish microscopically whether the changes are due to one cause or the other. The ultimate result in both is fibrosis.

The Signs and Symptoms of Subinvolution.—Enlargement of the uterus is *the* diagnostic sign of subinvolution. Apart from enlargement the condition cannot be clinically recognized. Yet, as has been seen, imperfect involution may exist not

only without obvious enlargement, but with a uterus reduced beyond its normal dimensions. But enlargement of the uterus is the rule and is the sole clinical sign of the condition. Not only is the uterus larger than normal but it is of softer consistence; its tonicity is diminished. On bi-manual examination the organ feels soft and somewhat boggy as well as heavier than normal. The sound is found to pass three to three and a half or even four inches. There is frequently an associated displacement; the uterus will be found lower in the pelvis than it should be, as the result partly of increased weight, partly of increased laxity of the uterine supports. More or less retroversion is not infrequent.

These conditions may exist without symptoms and without any disturbance of health, when the state of matters is likely to be overlooked; but, more commonly, definite symptoms are associated with this degree of subinvolution. The two chief symptoms are disturbed menstruation and pelvic discomfort; but there are others. After the completion of the puerperium the woman is easily tired and unfit for her usual work. She is tired on the least exertion, and complains of a sense of fulness or dragging in the pelvis with some downbearing. On standing, or after exercise, she suffers from backache which disappears on lying down. There is usually frequency of micturition, and nervous symptoms are not uncommon; in fact, the woman manifests all the symptoms usually ascribed to a retroverted uterus, though on examination the uterus may be found to occupy its normal position.

Menstrual disturbances take the form of irregularity and excess. Menorrhagia is the rule, but there may be metrorrhagia as well, and when the time of the menopause approaches the bleeding may be extremely profuse and difficult to control. Leucorrhoea is an almost constant accompaniment of subinvolution, and not infrequently there is dysmenorrhoea. The mental and nervous symptoms associated with subinvolution vary much. They may be entirely absent, but more usually the woman tends to become neurasthenic. She is often irritable and depressed, and, as Bandler has noted, may even show a marked tendency to melancholia. The symptoms that may be associated with subinvolution are many, but how far they are due to mere subinvolution and how far to infective and inflammatory conditions, which are liable to affect the imperfectly involuted uterus, is uncertain.

Treatment.—When subinvolution is recognized, whether during the puerperium or subsequently, treatment should be instituted at once. The longer the condition exists the greater is the tendency for permanent changes to result. When fibrosis occurs, a restoration of the uterus to its normal condition will obviously be impossible.

The prophylaxis of subinvolution falls within the province of the obstetrician. Much may be done to favour normal involution. Shortly, the prophylactic treat-

ment consists in the aseptic management of labour ; in securing the complete evacuation of the uterus in the third stage, so as to permit of efficient retraction and avoid the tendency to uterine congestion ; in strict attention to the bladder and rectum which must be regularly emptied ; and in securing the necessary rest. That mere getting up early in the puerperium retards involution is denied by those who advocate this plan. At any rate over-exertion in the early days of the puerperium, or later, by favouring uterine congestion, will hinder the normal process. According to Jellett,¹ nine-tenths of all cases of subinvolution are probably due to leaving bed too soon or to backward displacement of the uterus. Be that as it may, the causes of subinvolution are much more often local than general. During the puerperium the symptom which first draws attention to the existence of subinvolution is the persistence or the return of the red discharge. When the lochia continues red after the eighth day, or blood returns after it has disappeared, subinvolution should be suspected and the condition investigated. An examination should be made, and if the uterus is found to be retroverted, the position should be corrected and a small pessary introduced. This need be retained for only a few weeks as a rule. Should the uterus be found in normal position, but larger than it should be, the arrest of involution, where no local or general cause is discovered, will probably be due to retention of a part of the membranes or to an unhealthy condition of the endometrium. In either case the woman must be kept in bed, hot vaginal douches should be given, and ergot in full doses, either alone or combined with pituitary extract, administered for three or four days. Herman² found that the administration of ergot and quinine for the first week or more after labour had the effect of hastening involution, and recommended their routine use in all cases. Prophylactic douching has similarly been advised, but neither drugs nor douching are usually required, and neither should be employed. There is perhaps no great objection to the routine use of ergot save that it is unnecessary, but vaginal douching, unless carefully carried out, may do more harm than good.

If, in spite of treatment, the red discharge continues, the uterus should be explored, all *débris* removed with the finger or blunt curette, and the uterine cavity irrigated with hot saline solution or a weak antiseptic lotion. In obstinate cases Jellett has found benefit from the injection into the uterus of half a drachm of a 50 per cent solution of formalin. This is left for about thirty seconds and then washed out with water. The formalin causes uterine contraction and also helps to bring about a healthy condition of the inside of the uterus. Blair Bell recommends

¹ *Manual of Midwifery*, p. 984.

² Herman and Fowler, "On the effect of Ergot on the Involution of the Uterus," *Trans. Obstet. Soc. Lond.* vol. xxx. p. 85.

the employment of calcium lactate, in a dose of half a drachm to a drachm every night, in cases where blood persists in the lochial discharge beyond the tenth day. He finds this efficacious, and it is certainly worth trying. When delayed involution depends on general or pelvic morbid conditions, these must receive appropriate treatment.

During the puerperal period, then, rest combined with vaginal douches, the administration of ergot, alone or with pituitrin, and the removal of any local cause, will usually prove effective. When, however, considerable uterine enlargement persists after the end of the second month, the condition is much less amenable to treatment. Herman makes the statement, with which, however, we do not agree, that no treatment will then make the uterus smaller, and that nothing but another pregnancy will alter the state of the organ. A subsequent pregnancy may reduce the size of the uterus, but it does not follow that it restores it to its normal condition. If subinvolution is allowed to persist for a considerable period, changes take place in the uterine wall that are permanent and not materially affected by pregnancy; and hence the great importance of prophylaxis and early treatment.

The treatment of subinvolution in this later stage consists in absolute rest in bed, in regular evacuation of the bowel, in the employment of hot vaginal douches, and of glycerine or glycerine and ichthyol tampons which have the effect of relieving pelvic congestion and thereby promoting involution of the uterus and other pelvic structures. Iron and general tonics are usually required, and drugs to improve the circulation will be beneficial. For the menorrhagia which is nearly always present, the use of the curette will often be of great service in improving the condition of the uterine mucous membrane. Not only will menstruation become normal but the uterus will gradually diminish in size. For the first few days after the operation, one-drachm doses of ergot may be given three or four times daily. In most cases curettage will check the excessive bleeding and lead to a reduction in the size of the uterus; but about the time of the menopause the bleeding may be so profuse and intractable that nothing short of hysterectomy will check it. In these cases there is usually a marked fibrosis of the uterus or arterio-sclerosis of its vessels. Though these conditions are not necessarily the result of subinvolution alone, morbid involution is probably in many cases their starting-point. As an alternative to hysterectomy X-ray treatment would seem to promise good results. So far the writer has had only one opportunity of trying this method, in a case where the woman refused hysterectomy. The result was not satisfactory, but the recent improvement in the method of application and the effect of the rays on uterine fibroids suggest that this line of treatment is worth a trial.

SUPERINVOLUTION OF THE UTERUS : LACTATION ATROPHY

Superinvolution, or hyperinvolution, of the uterus signifies an extreme degree of involution in which the retrogressive changes following pregnancy are carried beyond their physiological limit, and the uterus is reduced below its original unimpregnated size. The condition is one of great interest from the indirect light it throws on the process of involution, but in its more marked forms it is very rare. Some degree of superinvolution is believed to be the rule in nursing women. After the second month of the puerperium the uterus may be found to be actually smaller than before pregnancy. This lactation atrophy is in most cases temporary, the uterus later regaining its normal size. In pathological atrophy, on the other hand, the uterus continues to shrink, and the reduction in size remains permanent.

The extent to which the uterus is diminished varies, but in extreme cases the organ may be reduced far beyond the infantile size. In several cases it has been found no larger than the distal phalanx of the thumb. In A. R. Simpson's case the sound passed no more than an inch, while in a case reported by Whitehead the uterus seems to have disappeared altogether. In the earlier stages of this puerperal atrophy the walls are thinner and softer than normal; the bulk of the uterus is diminished, but there may be no diminution in the length of the uterine cavity as measured by the sound. This is sometimes termed eccentric atrophy and the condition can be recognized only by bi-manual examination. As the process advances the uterine wall becomes thinner but of firmer consistence, while the cavity is greatly diminished, the sound passing only two inches, one and a half inches, or less. This uniform reduction in the dimensions of the uterus is termed concentric atrophy.

The changes in the wall of the superinvolved uterus have not been minutely studied, but it is probable that the process affects all the tissues though not in equal degree. The muscular elements suffer most, many of the fibres are completely destroyed; the remaining fibres are compressed, thinned, and in poor condition. The connective tissue is also diminished, more particularly the elastic tissue, the fibres of which are ill-developed and lacking in tone. Many of the uterine vessels are thrombosed and obliterated. The mucous membrane is abnormally thinned.

Etiology.—The causes that lead to this perversion of a physiological process are meantime conjectural. Ill-health associated with over-lactation are perhaps the most common antecedents, but in what way they operate is not known. Another etiological factor would seem to be *post-partum* haemorrhage, which has been noted in many of the cases. In four cases of superinvolution seen by Blair Bell a “flooding” followed delivery, and the subsequent discharge remained blood-stained longer

than usual. Longridge attributes the occurrence of superinvolution after *post-partum* haemorrhage to extreme uterine anaemia. As the result of loss of blood and general anaemia the uterine vessels become thrombosed and the blood-supply of the uterus cut off. The acidity of the uterine tissues, which normally obtains after labour, is not, as it should be, neutralized later, and autolysis proceeds with abnormal rapidity. Besides the causes mentioned, there are others to which superinvolution has been ascribed,—acute or chronic pelvic inflammation which interferes with the pelvic circulation and diminishes the vascularity of the uterus; bilateral ovarian disease which leads to atrophy similar to that which occurs at the menopause; all those diseases which, apart from pregnancy, tend to cause amenorrhoea and uterine atrophy. In some cases no cause whatever can be assigned.

Symptoms.—The symptoms of superinvolution are chiefly menstrual. Apart from more or less menstrual disturbance, there may be no symptom of any kind. Absent or scanty menstruation is the most constant symptom of the condition. Not infrequently there is dysmenorrhoea, the pain, which may be severe, usually preceding the period by a day or more. Even with amenorrhoea, there may be monthly attacks of pain which last for a few days. The woman's health is usually impaired, but this is the cause more often than the effect of the condition. Nervous symptoms and neurasthenia are not uncommon. In extreme degrees of superinvolution there is always sterility, and it is probable that even its slighter forms, where the diminution in the size of the uterus cannot be ascertained clinically, may have the effect of preventing pregnancy.

The symptoms are largely those of the menopause, and it is the premature arrest of the menstrual function that, in most cases, leads the woman to seek advice. The diagnosis rests on the history of amenorrhoea following parturition and persisting after nursing has stopped, and on the size of the uterus which bi-manual examination will show to be appreciably smaller than normal and very mobile. The length to which the sound passes will depend on the extent and the type of the atrophy. It may pass almost the normal length or only one and a half, or even one, inch. Owing to the thinness of the uterine wall, great care must be exercised in passing the instrument.

Treatment.—As the condition is usually well established before there are any symptoms which would suggest an examination and lead to its detection, prophylactic measures are seldom possible. Even were the possibility of its occurrence suspected early, so little is known of the causes of superinvolution that treatment would be largely empirical, and would afford at best an uncertain chance of success. In long-established cases, particularly where associated with ovarian disease, little

or nothing can be done to restore the size of the uterus or promote menstruation. Electrical treatment seems to promise most success. The current must be applied directly to the uterus, one electrode on the cervix or in the cavity, the other on the abdominal wall. Along with electrical treatment, Blair Bell advises the administration of thyroid extract. With a view to producing uterine irritation, intra-uterine stem pessaries have been recommended. These may lead to an increase in the size of the uterus, but they do not otherwise improve the condition or relieve the symptoms. Thus they are of no real benefit, and as their use is not without risk they should not be advised. In the treatment of superinvolution, our efforts should be directed chiefly to improving the general health by an abundance of nourishing food, and by the administration of tonics, particularly iron, and by change of air. If the accompanying dysmenorrhoea is severe, it must be treated in the usual way. Where, as often, it is very intractable, hystérectomy has been advised, but this should rarely, if ever, be necessary. The woman, who is often unduly anxious about the absence of the menstrual function, should be reassured, and convinced that of itself this is not serious and involves no risks.

LACERATIONS OF THE CERVIX

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UNDER normal circumstances the tissues of the cervix are capable of great dilatation, but to make this dilatation possible ample time and due preparation are necessary, otherwise tears will readily occur. Such tears are probably the most common accidents of child-birth.

Causation.—Lacerations usually result from the os being suddenly and forcibly dilated, as it were taken by surprise, whether it be the os of a non-pregnant woman, or of one in early or late pregnancy, or one in labour whose os is dilated almost to its fullest extent. In the non-pregnant state it is often necessary to dilate the cervix, and if this is done by means of rigid metallic instruments great injury may result. Such accidents are, no doubt, rare, but the writer has seen an experienced gynaecologist compelled to perform hysterectomy because of the injury resulting from dilatation of the cervix preparatory to a simple curettage. During labour, more than at any other time, tearing of the cervix is likely to occur, though under conditions of normal delivery, where the membranes have not ruptured till the presenting part has passed through the os, this seldom or never happens. The injury frequently follows premature rupture of the membranes, or malpresentations, and is the rule when operations of any kind are employed to assist the dilatation. There is no more potent cause of the injury than the application of forceps through an os the rim of which can be felt in any part of its circumference. The indiscriminate use of forceps, formerly so much in vogue, has happily become less common, and the gain in the practice of those who never employ them except in accordance with strict indications is enormous. Special cervical dilators, such as those of Bossi and Frommer, may be placed in the same category as the forceps. The use of all such instruments is attended with danger, but when they are used to force open a cervix to a diameter of more than seven centimetres they will almost certainly cause

laceration. Such lesions will often pass unnoticed, and the operator will remain sceptical of their existence unless he examines the parts with his finger or with a speculum immediately after delivery.

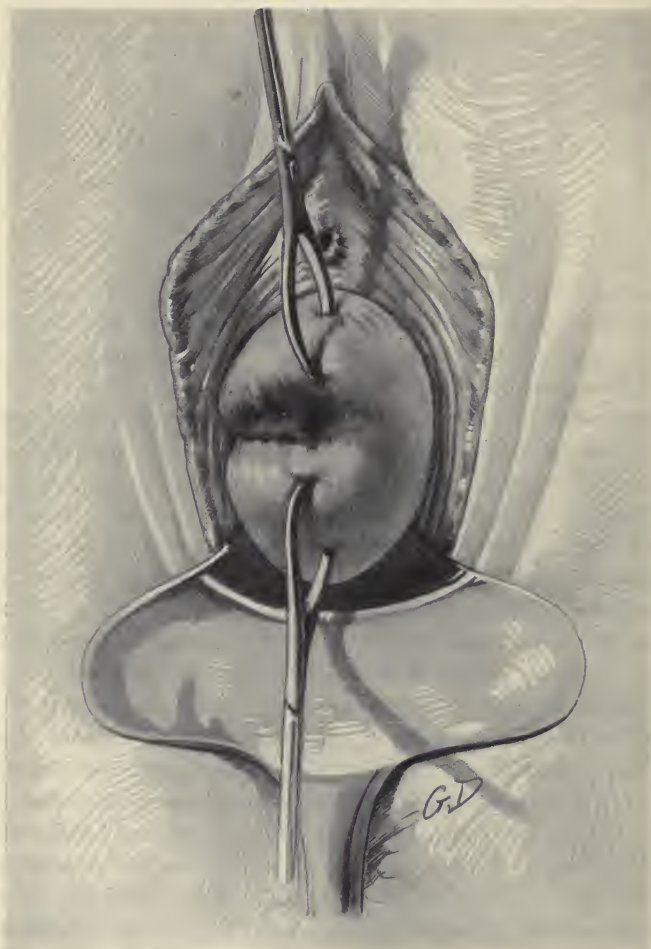


FIG. 72.—Unilateral cervical tear. Forceps have been employed to demonstrate its extent.

Placenta praevia as a cause of laceration must be placed in a category by itself. Any attempt to dilate the cervix in this condition is fraught with serious danger

because of the destructively eroding processes resulting from the low insertion of the placenta.

Faulty manipulation of instruments, and the introduction of the hand into the uterus after child-birth, are other important causes of cervical lacerations.

Character of the Tears.—The tears are usually bi-lateral, but may occur on one side alone, generally the left; they may, however, be stellate, or be confined to the anterior or posterior lip (Figs. 72 and 73). Portions of either lip may be torn completely away, or may hang into the vagina as a polypoid mass attached by a narrow pedicle. At times the tear extends into the bladder causing a vesical fistula, but more frequently the base of the broad ligament is opened and the tear may reach the internal os, or even pass upwards beyond it. The tears vary in extent as they do in position, and while they are often so insignificant as not to call for any interference, they may be so severe as to need immediate operation.

Appearances and Pathological Condition.—The lacerations may be greatly obscured by imperfect involution and by the healing processes that take place during the puerperium. The mucous membrane often partially bridges over a gap and makes the extent of the tear difficult

to appreciate by direct inspection; examination with the finger discovers the condition with greater certainty. At times the superficial healing is still more complete, and a diagnosis only becomes possible when a sound is passed through the os, thus discovering the bellied and widely-dilated cervical canal. This atonic canal is usually filled with a muco-purulent discharge, which is a source of much discomfort and ill-health. When the vaginal portion of the cervix has been torn away, the neighbouring mucous membrane becomes rolled inward to cover the raw surface, and thus the bladder is often dragged over the deficient area. Portions of the cervix may adhere to the side-walls of the vagina, forming a bridge across the lateral fornix. Neglected tears of any considerable extent are almost always



FIG. 73.—Triradiate cervical tear. The rugose area below is the posterior vaginal wall.

associated with inflammation, and this adds special features to the picture. In this way granular and glandular 'erosions' arise, which not only destroy the squamous epithelium in their neighbourhood, but penetrate deeply through the substance of the cervix, destroying its normal tissue. These new growths cause the cervical lips to gape apart, giving rise to the appearance known as "ectropion." A mass of scar-tissue is constantly found in the apex of an uncured laceration—the so-called fibrous plug about which so much has been written. The red, inflamed, cervical mucous membrane, bathed in a muco-purulent secretion, can be easily mistaken by the careless observer for an erosion, but if the lips of the cervix are pressed together, the red portion due to the ectropion will disappear, and the irregular red surface which remains, constitutes the new growth of erosion. The exposed mucous membrane may for many years show this red irregular surface, but sooner or later there is a gradual encroachment of squamous epithelium, which eventually covers the entire area, and converts the cervix into a bluish, congested, and hypertrophied mass, beneath the surface of which will appear numerous retention cysts, known as "Nabothian follicles." Leucorrhoeal discharges then cease, but there is no amelioration of other symptoms.

Clinical Results.—Until Emmet, by his writings, pointed out the true significance of tears they received but scant attention, and were entirely misunderstood by European gynaecologists. The importance attached to them by American writers was stoutly denied by the majority of workers in Europe. Now few doubt their importance, and though they cannot be said to give rise of themselves to any actual symptom, undoubtedly they constitute one of the most potent predisposing causes of disease. A severe tear will with certainty lead to one or more of the following complications :

Immediate effects—

1. Traumatic *post-partum* haemorrhage.
2. General acute sepsis from infection of torn surfaces.
3. Parametritis, perimetritis, acute and chronic endometritis, with salpingitis by extension.

Remote effects—

4. Chronic metritis, with enlargement of the uterus.
5. Subinvolution of the uterus and its ligaments, with backward displacement.
6. Endocervicitis with erosions.
7. Descent and prolapse of the uterus.
8. Ulceration of the cervix.
9. Cancer of the cervix.

In consequence of the above lesions the following train of *symptoms* may appear :
Leucorrhoea resulting from endocervicitis and leading to vaginitis, vulvitis
with erythematous conditions of the neighbouring skin, and to toxic
symptoms due to poisonous absorption.

Feeling of weight in the loins, pain in the back, and headache.

Constipation, dyspepsia, and neurasthenia.

Pain in the iliac fossae and dyspareunia.

Sterility or miscarriage.

In analysing this formidable list, it will be seen that many of the conditions mentioned result from sepsis ; but sepsis is rendered more likely because of the presence of the tears, and it cannot be doubted that the path of invasion, in the case of many women, has been through these raw surfaces. The relationship which exists between laceration and such conditions as enlargement and displacement of the uterus, menorrhagia and miscarriage, pain in the back, constipation and neurasthenia, may in part be connected with sepsis, and in part with an alteration in the circulation of the blood and lymphatics due to direct destruction of the vessels. Peritonitic adhesions, and scar-tissue in the broad ligament, account for other symptoms.

Special reference must be made to two conditions, namely *prolapse* and *cancer*. As regards the former, it is at first difficult to see the connection between prolapse and a lacerated cervix, and it is only within recent years that attention has been directed to the subject. One rarely sees a procidentia that is not accompanied by an old tear, and by a history of instrumental delivery, and it becomes important to examine the relationship which exists between the two. Anatomists have recently called attention to the presence of a strong fibrous structure, containing muscular and elastic fibres, which is found to surround the uterus in the neighbourhood of the os internum, and to radiate from this in every direction, to obtain a firm attachment on the brim of the true pelvis. Mackenrodt¹ in 1895 calls special attention to the lateral portions of this subperitoneal or parametric tissue, and assigned to it the name of *ligamentum transversale coli*. Alexanderoffe² appreciating that a weakening of these pseudo-ligaments as a result of a torn cervix constituted the predisposing cause of uterine prolapse, devised in the year 1903 an operation which had for its object a shortening of this ligament. In the year 1905 the present writer³ described an operation based on similar lines, and one which necessitated amputation of the cervix as a preliminary procedure. Jellett,⁴ in 1911, following out the same idea,

¹ Mackenrodt, *Archiv für Gynäkologie*, Bd. xlviii., 1895.

² Alexanderoffe, *Zentralbl. f. Gyn.* vol. xxv., 1903.

³ Tweedy, *Journ. of Obstet. and Gyn. of the Brit. Emp.*, May 1905.

⁴ Jellett, *Surgery, Gyn. and Obstet.* pp. 206-208, August 1911.

advised shortening of the subperitoneal tissue beneath the sacro-uterine ligaments. Fothergill,¹ Moritz,² and others have established the importance of this tissue, and consider it the chief support of the uterus, and there seems little doubt that proclenia can result from injury arising to it in consequence of deep cervical tears.³

Cancer of the cervix does not come within the range of this article, but it deserves particular mention because of its overwhelming prevalence in women who have borne children, and who have in consequence suffered from the traumatism of labour.

Treatment.—It is obvious from what has been written that tears of any severity constitute an actual or potential danger, and no question should arise as to the necessity for their repair. The time is long since past when gynaecologists can be satisfied by the continuous and unsatisfactory palliative treatment so much in vogue half a century ago, treatment which brought them deserved discredit. On the supposition that they were dealing with an ulcer they applied the strongest caustics, and varied them by astringent lotions, tampons, and vaginal douches. Patients subjected to such treatment returned week after week and month after month to the practitioner, who seldom found himself in a position to state that a cure had been effected. The cure expected was the covering of the red surfaces with squamous epithelium, leaving the deeper parts still in a diseased state. The glandular erosions remained, their ducts were occluded, and their retained secretion formed high-tension cysts, which appeared like sago grains beneath the bluish unhealthy epithelium. The lips of the cervix were left in a hypertrophied and indurated condition, and the uterus remained enlarged, and subject to all the troubles resulting from chronic congestion.

It is unnecessary to enquire how much of this treatment still remains in vogue. Any excuse for its adoption has long since passed, and one can now definitely assert that a cure can only be effected by surgical means.

Operative measures may be divided into two groups: (1) those that have for their object the closure of the rents: *trachelorrhaphy*; (2) those that endeavour to remove the pathological condition brought about by the rents: *partial amputation of the cervix*.

Trachelorrhaphy.—There are two important types of this operation, one devised by Emmet, and the other by Säger. The latter is the easier to perform and offers less opportunities for septic infection; it is also less likely to cause permanent contraction of the cervix, and is eminently suitable for cases

¹ Fothergill, *Journ. of Obstet. and Gyn. of the Brit. Emp.*, January 1908.

² Moritz, *Journ. of Obstet. and Gyn. of the Brit. Emp.*, October 1914.

³ This subject is also discussed in the Article on Prolapse, p. 627.—EDDINGS.

in which there is a single or bilateral injury, uncomplicated by hypertrophy or other changes of the cervix.

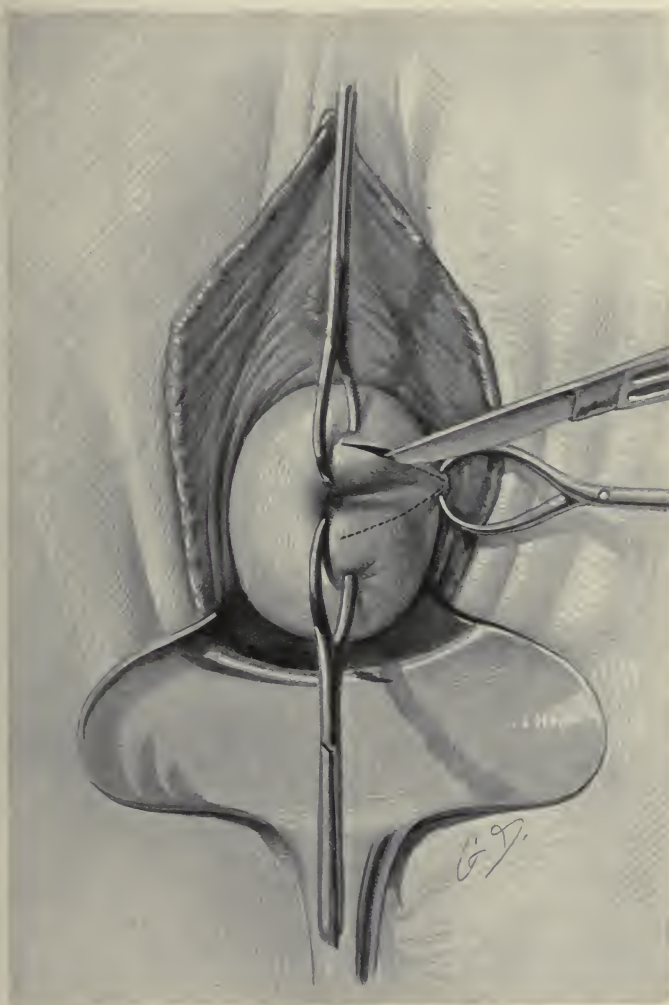


FIG. 74.—Säger's trachelorrhaphy. Demarcation of >-shaped flap by three forceps.

Säger's Trachelorrhaphy.—The upper and lower lips of the cervix are each held in a firm grip by bullet forceps, attached in the neighbourhood of the tear at its

commencement. A third forceps is placed through the tissues of the lateral fornix, outside the termination of the tear (Fig. 74). When these forceps are pulled in

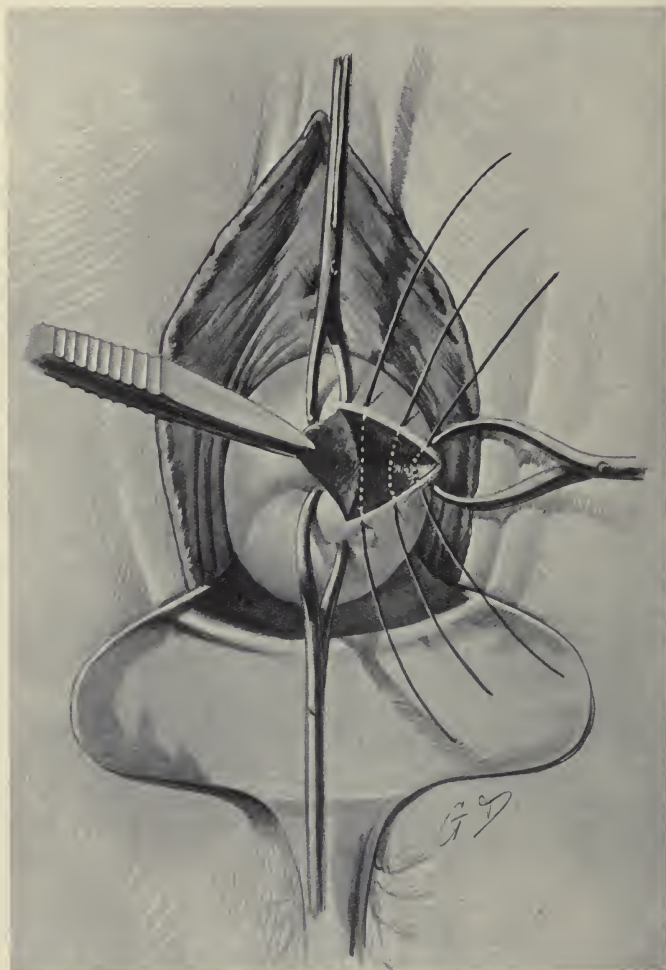


FIG. 75.—Sänger's trachelorrhaphy. Flap pulled towards mid-line while the deep sutures are inserted.

different directions by assistants, the gap in the cervix will appear as a >-shaped or triangular figure. With a sharp scalpel an incision is made from the forceps on

the anterior lip to the one placed at the fornix, and back again from the latter point to the forceps on the posterior lip. The structures around the tear are thus split into flaps. A forceps is applied to the apex of the inner flap, and this is gently pulled towards the middle line whilst the raw surfaces are deepened (Fig. 75). This deepening process may be continued until its greatest depth equals the length of one of the lateral arms of the incision. Whilst the inner flap is still kept well towards the opposite side, catgut sutures are placed from above downward, to unite the upper and lower raw surfaces throughout their entire depth. The last suture will immediately bound the external os, and will take in the base of the internal flap, the free edge of which may be left unsutured, for it will fall without aid into its proper position. A similar manœuvre may, if necessary, be performed on the opposite side, and a cervical canal will remain which has no communication with the repaired raw surfaces.

Emmet's Trachelorrhaphy.—Excellent results can be obtained by this operation, but it is more difficult and requires considerable technical skill. Here again bullet forceps are applied to each lip of the cervix and the latter are separated to their fullest extent. If this is impossible because of a one-sided tear, an incision is made at the other side to correspond to the tear, and this will permit a wide opening of the cervix. The scalpel is inserted about a quarter of an inch to one side of the bullet forceps attached to the centre of the upper lip, and a vertical incision is made downwards through the mucous membrane of the cervix, passing to the side of the internal os, and then along the lower cervical lip, so as to terminate at a corresponding point by the side of the lower bullet forceps. A similar incision is made from above downwards on the other side of the bullet forceps (Fig. 76). An incision is now made to pass around on the outer side of the cervix so as to embrace the surface which was originally left raw by the tear. A corresponding incision is made at the slit side. These lateral incisions begin and end at the upper and lower extremities of the vertical cuts. It will be seen that a mucous surface is now mapped out, capable of being utilized to form a new cervical canal, and that it is embraced between the two vertical inner incisions. The structures between the outer and inner incisions on each side consist of adventitious tissue, which must be removed and which can be easily stripped from underlying structures with the aid of scalpel and dressing forceps (Fig. 77). Stitches are inserted as follows: the first horizontally through the raw surface in the neighbourhood of the bullet forceps, so as to emerge at the immediate edge of the mucous membrane strip. The needle is again entered at the corresponding part of the lower lip, and the suture which it carries is left untied until all others are placed in position. Other

sutures are inserted below the first and in a similar manner (Fig. 78). The

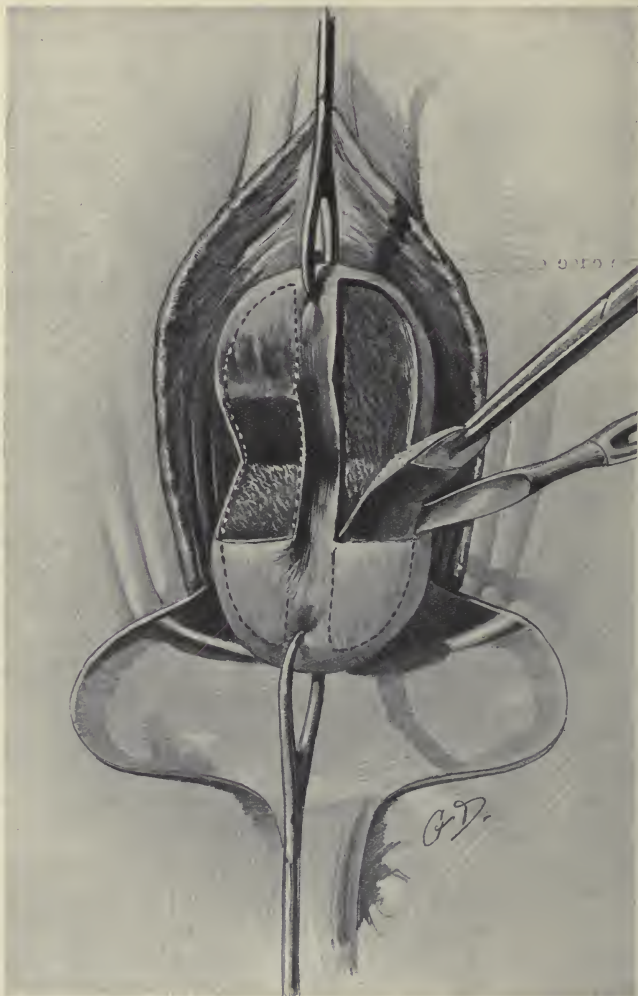


FIG. 76.—Emmet's trachelorrhaphy for bilateral laceration. Shows the diseased flap in process of being removed; on opposite side result of lateral splitting of the cervix is shown.

last one will pass just above the os, and emerge just below it. When fastened it will enclose the apex of the wound. A similar procedure should be adopted

in respect to the corresponding raw surfaces on the other side, and the knotting

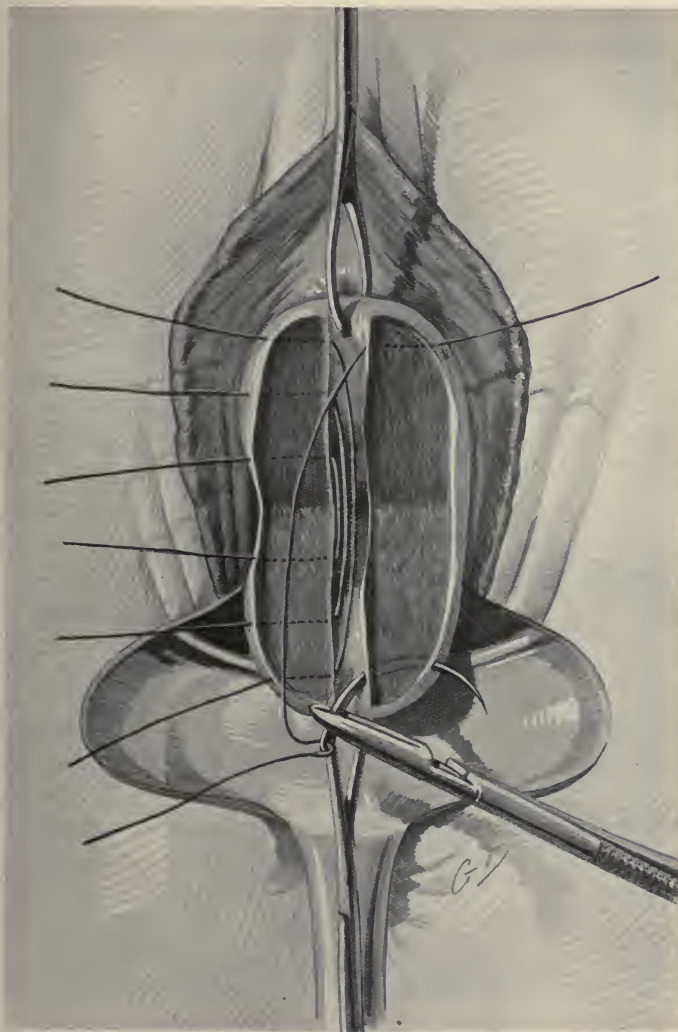


FIG. 77.—Emmet's trachelorrhaphy. Shows the raw surfaces on either side of central strip of mucous membrane. Note the insertion of sutures, completed on one side and beginning on the other.

of ligatures should not be undertaken until the end. This operation should be

attended with uniform success, but unfortunately this is not so, and it is well to recall some of the commoner causes of failure.

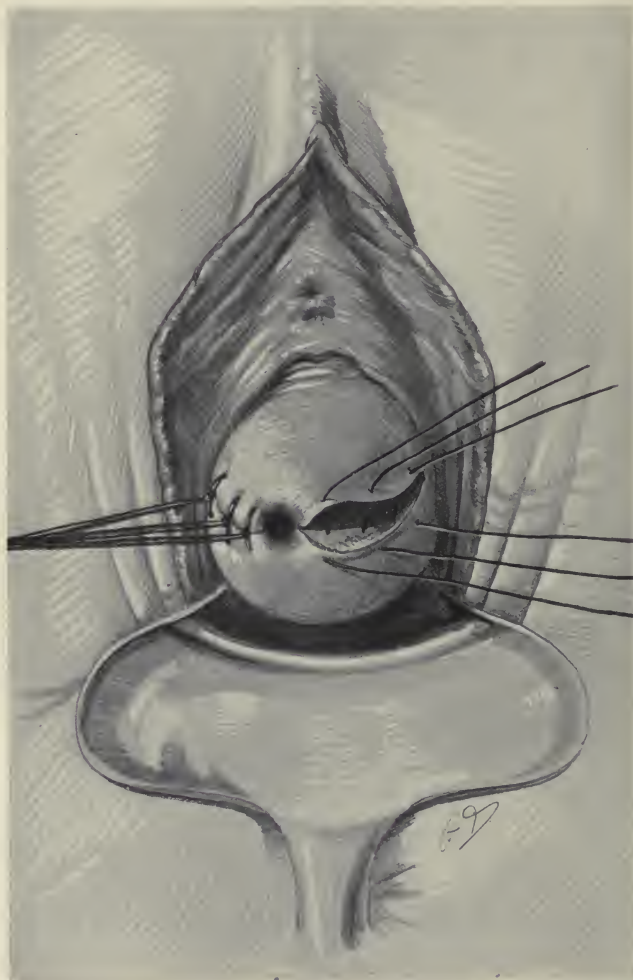


FIG. 78.—Emmet's trachelorrhaphy. Operation about to be completed.

Asepsis is difficult in vaginal work, and is seldom as perfect as in abdominal work. Such failure to procure asepsis, very rarely occasions a general blood-poison-

ing, but infection of raw surfaces interferes with perfect healing. Surgical cleanliness is particularly difficult to carry out when operations are conducted in the patient's bedroom, amidst unsuitable surroundings, and with insufficient help.

Want of success often arises from the employment of unsuitable instruments, and from an insufficiency of light and space wherein to work. The absence of either or both will make the accurate placing of stitches difficult, and hamper the operator's efforts to secure a continuous raw surface.

In cases where the cervix cannot be pulled down, the difficulty of inserting stitches accurately is increased, and this complication also makes the complete removal of the scar-tissue in the angle of the old tear uncertain. This complication is due to pelvic disease, and trachelorrhaphy should constitute merely part of the operative treatment.

Harm frequently follows the employment of unabsorbable sutures which have to be cut out. Silk and silkworm gut are the chief offenders in this respect, and it is always hard, and sometimes impossible, to remove them, even at the end of the third week, without re-opening raw surfaces.

Lastly failure arises from selecting unsuitable cases for the trachelorrhaphy operation.

Operation should be conducted in a suitable theatre.

The following instruments will prove useful in addition to those which are obviously essential. A long scissors curved on the flat, Martin's stout cervix needles with wide eyes, Martin's long-handled needle-holder, Martin's broad, short-bladed vaginal speculum, two long Kocher's forceps, two Landau's forceps, number 4 unchromicized catgut.

A very prevalent opinion exists, that the results obtained by the use of catgut in vaginal operations are not good; the catgut is said to be liable to dissolve before the healing is complete, and also to have a tendency to cause suppuration. It seems certain that these objections are due to the employment of imperfectly prepared gut, to the strands being too fine, or to improper tension being placed on the sutures. Both these latter conditions will cause rapid absorption but they need not occur. A question of greater difficulty arises as to the disinfection of the catgut. Most of the devices recommended are unsatisfactory, but the following plan may be absolutely relied upon. Catgut, cut in suitable lengths, is suspended in an oven, so that no part of it comes in contact with the sides. The temperature is gradually raised to 280° F. and kept at this heat for half an hour. The gut is then suspended in liquid paraffin the temperature of which is gradually raised to 300° F., at which temperature it is kept for half an hour. When removed from this it is placed in the following

solution: iodine 30 gr., iodide of potassium 80 gr., rectified spirit 15 ozs. It may remain in this solution a considerable time without deterioration, but on the whole it is best to prepare the catgut shortly before an operation.

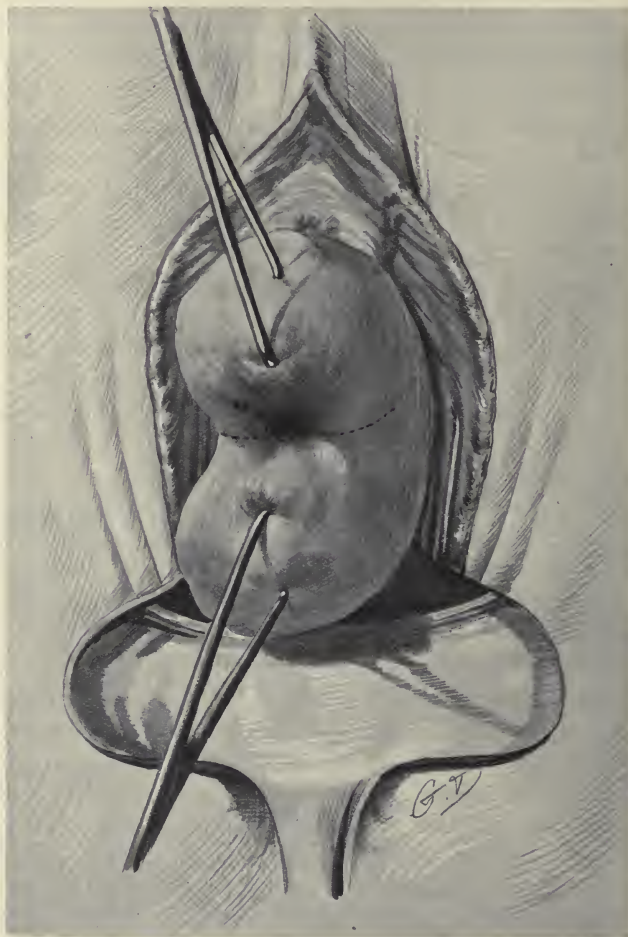


FIG. 79.—Torn and hypertrophied cervix suitable for cure by Schroeder's amputation.

Primary and secondary haemorrhages may occur as occasional complications, and greatly interfere with the prospect of normal healing. The primary haemor-

rhage is due to insufficient care in enclosing the angle of the wound by a properly placed suture, and the secondary bleeding follows on a septic condition.

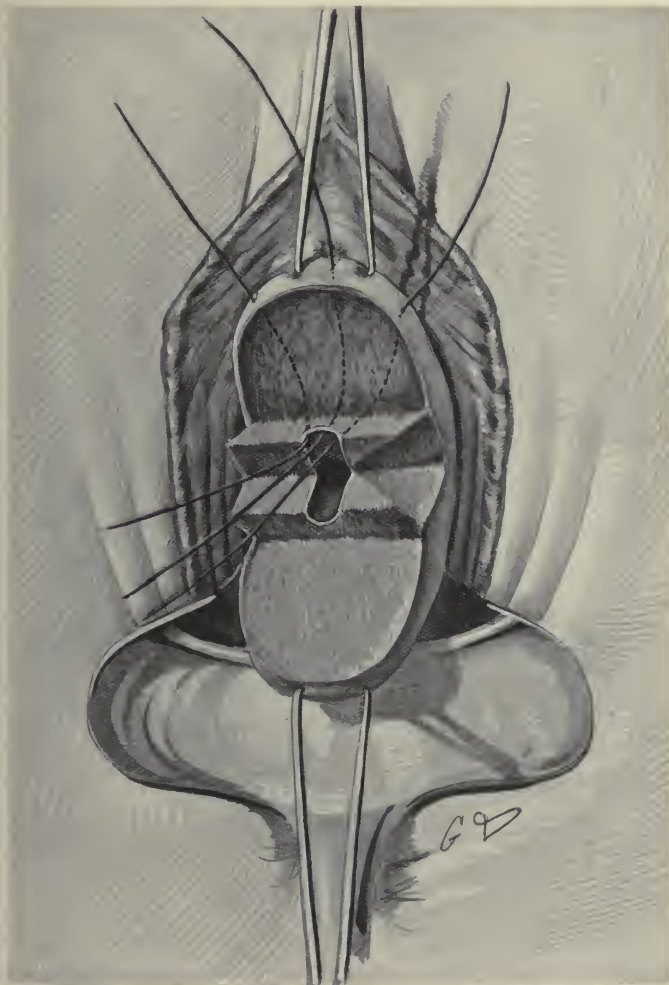


FIG. 80.—Schroeder's amputation of cervix. Shows lateral incision into cervix with removal of wedge-shaped piece from upper lip, and stitches in position; also marks a lateral area where additional excision of tissue is advised.

Catgut sutures should be fastened with four knots, and it is a good plan to dry

the site of operation and remove moisture by lightly plugging the vagina with iodoform gauze, which may be left in position for six or seven hours.

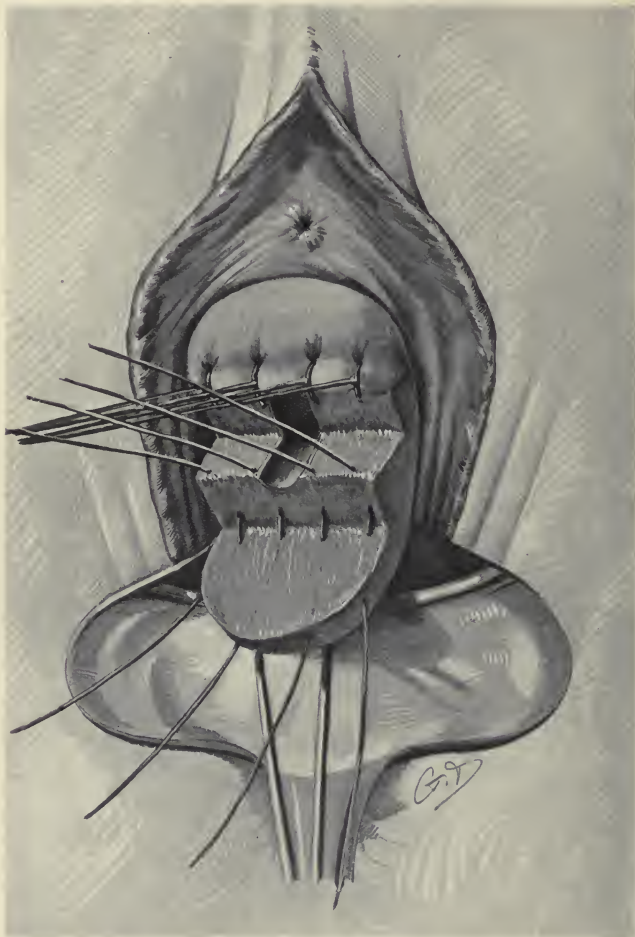


FIG. 81.—Schroeder's amputation. Raw surface closed in upper lip; sutures still untied in lower lip.

Purgative medicine should be administered at the end of twenty-four hours, and the patient may with advantage remain in bed for three weeks. During this time it is best not to make any examinations, neither should douching nor other

local treatment be adopted. Drainage will be promoted by permitting the patient to sit up in bed for meals.

Amputation of the Cervix.—Lacerations complicated with erosions, hypertrophy, or fibrous thickening are best treated by either partial or complete amputation of the cervix.

Schroeder's Partial Amputation.—Bullet forceps are placed on the anterior and posterior cervical lips, and Martin's speculum is inserted as for trachelorrhaphy. It is best to insert the forceps points in a line parallel with the tear and at the outer surface of the eroded tissues. The lips of the cervix are separated by incising the lateral fornices (Fig. 79). When this is accomplished the assistant is able to pull the cervical lips far apart. The operator makes a deep transverse incision across the anterior lip on a level with the farthest boundary of the tear. The knife then sweeps around the circumference of the cervix, beginning at one end of the transverse incision and ending at the other. A wedge-shaped piece of cervical tissue is then removed as shown in Figure 80. The procedure is much facilitated by holding the mucous flap in the grip of a Landau's forceps. Catgut sutures are inserted between the points and at each side of the bullet forceps, and these three sutures are made to pass through corresponding portions of the deep shelf which bounds the upper part of the cervical canal (Fig. 80). The deeper the grip taken of the cervical mucous membrane the less likelihood will there be of the suture cutting out, and this constitutes an essential feature of success.

The posterior lip is dealt with in a similar manner (Fig. 81). The cervix will now appear to have an anterior and a posterior lip closed by sutures in their centres, and with raw and bleeding surfaces at either side. These surfaces must now be dealt with, and it is very desirable to cut from the angle of each any fibrous connective tissue or loose tag of epithelium which may still remain. It will be found that this procedure enables the angles and sides of the wound to be closed without pouting of tissues or putting undue strain on the sutures. The sutures are inserted so as to bring the upper and lower borders of the wound together, and the first one should be placed outside its angle. When this precaution is taken, and when the stitch is sufficiently deep, there is little fear of subsequent haemorrhage. The first suture when placed in position is held by an assistant, and this facilitates the further stitching of the raw surfaces. These surfaces are closed so as to form a round and not too gaping os (Figs. 82 and 83). The further treatment is similar to that of trachelorrhaphy.

Statistics have recently been published from the Johns Hopkins Hospital giving a comparison between the results obtained from trachelorrhaphies and amputations of the cervix, and the figures show that in many respects, particularly

as regards subsequent pregnancies, the operation of trachelorrhaphy is attended

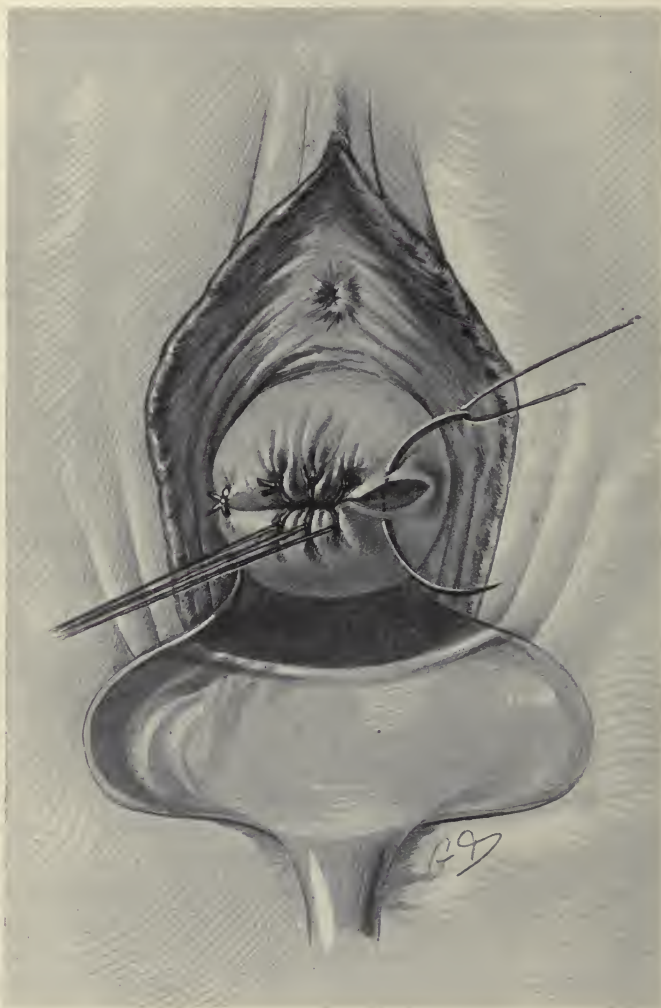


FIG. 82.—Schroeder's amputation. Shows closure of lateral raw surface on one side.

with more favourable results than that of amputation. Leonard¹ attributes this

¹ Leonard, *Surgery, Gyn., and Obstet.* pp. 35-45, January 1914.

superiority to the fact that stenosis is more apt to occur as a result of the latter operation. There is no necessity that this should be so, for it can only be the result

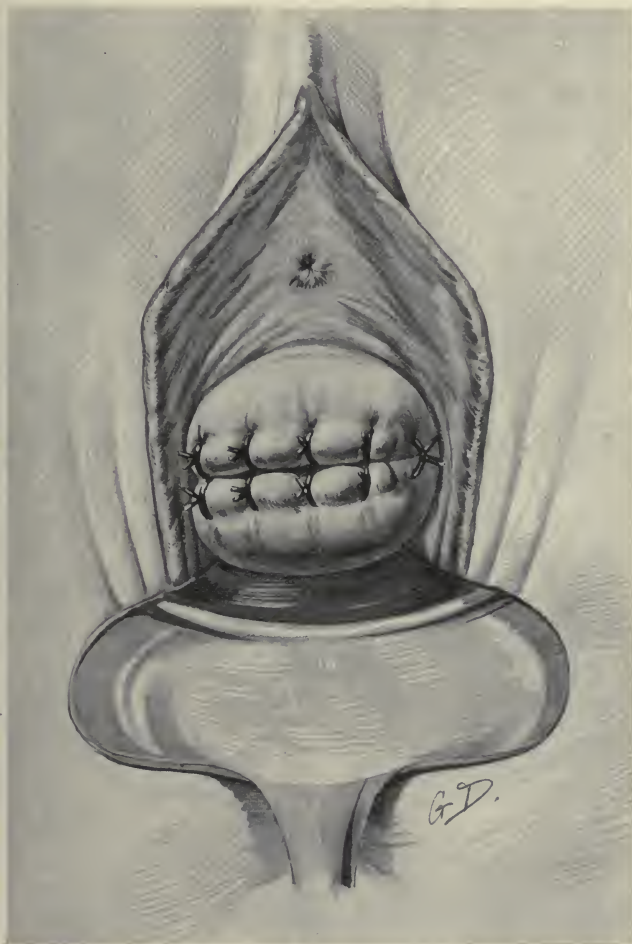


FIG. 83.—Schroeder's amputation. Appearance at end of operation.

of faulty technique. If the advice given to ensure success in trachelorrhaphy be also followed in amputation, stenosis should not arise more frequently in one than in the other. The fact that pregnancy is rare after amputation is almost certainly

due to the greater severity of the conditions for which the operation has been

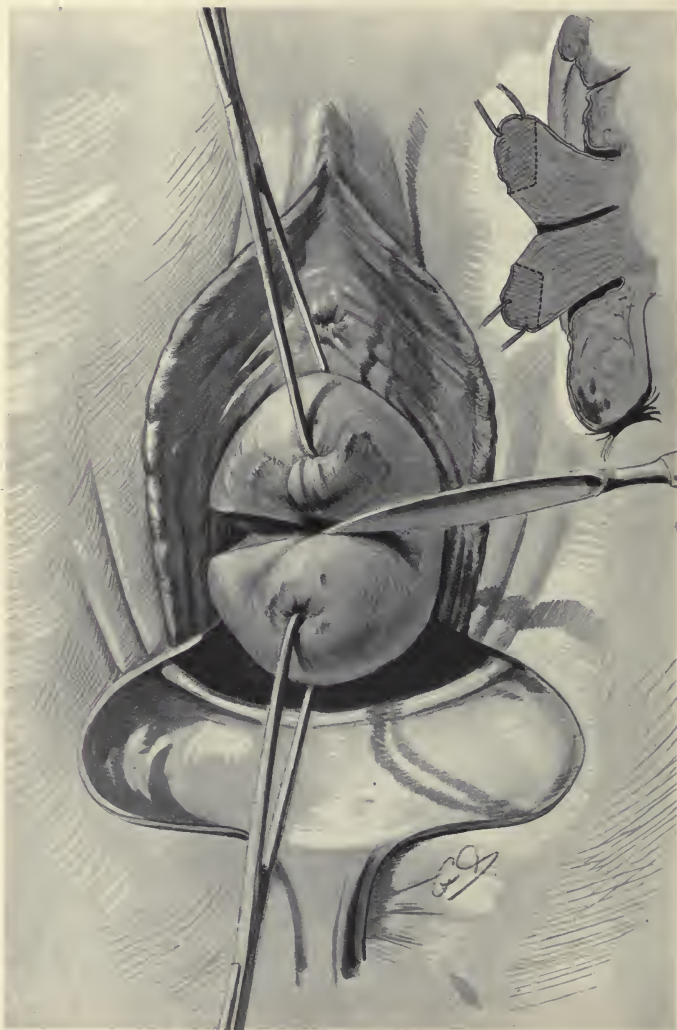


FIG. 84.—Markwald's amputation. 1. Preliminary incision to divide the cervix into upper and lower lips.
2. Inset shows lines which indicate the shape of tissue to be removed.

undertaken. When reference is again made to the formidable list of complications

associated with tears, it is not surprising that subsequent sterility should be the rule rather than the exception. When a tendency to prolapse exists, or when the lips of the cervix are more than usually hypertrophied, complete amputation may commend itself as the best means of rectifying the results of the tear. For this purpose the technique recommended by Markwald is to be preferred.

Markwald's Amputation.—The lips of the cervix are seized as before by bullet forceps and an incision is made through both commissures. Wedge-shaped portions of tissue are then removed from both anterior and posterior lips. Each lip will thus consist of two flaps—an inner one which will correspond to the mucous membrane of the cervix, and an outer one to that of the vaginal skin (Fig. 84). These flaps are united through their entire depth with strong catgut ligatures and the lateral raw surfaces are finally closed. To save undue haemorrhage it is well to complete the suturing of one lip of the cervix before the incisions are begun in the other lip. The divided commissures are finally closed.

Text-books describe slight modifications of this operation under the name of different authors. No practical advantage arises from this, for the operations are too trivial to have an historical interest, and Markwald's methods contain all the good features of the others.

MYOMATA

By CUTHBERT LOCKYER, M.D.
(London)

THESE tumours are commonly known as fibroids or fibromyomata ; their usual situation is in the walls of the uterus, but they may arise from the muscular tissue of the round ligaments, from that of the ovarian ligaments, or in that of the broad ligaments and of the vagina.

ETIOLOGY AND HISTOGENESIS

The *causation* of myomata is obscure. Ribbert's view is that the germs of the growth are deposited in the connective tissues during foetal life, and that they are subsequently stimulated to active development by some excitant such as hyperaemia.

The question of the part played by heredity in tumour-formation generally is a matter of dispute. It is certainly striking how "fibroids run in families." A patient of my own is one of five sisters, four of whom have had uterine myomata, and the fifth refuses investigation but is thought to be similarly afflicted.

Since myomata obtrude themselves during sexual life, it is only natural to infer that 'ovarian activity' has a good deal to do with their growth, and the influence of ovarian hormone on the development of myomata is confirmed by the clinical results of oöphorectomy.

The *histogenesis*, like the etiology, is also a matter of pure speculation. Virchow regarded each muscle-cell in the uterus as capable of generating a myoma. Cohnheim's theory of embryonic 'rests' has been applied to myomata, and corresponds with the view of Ribbert. Some investigators claim to have shown that these growths spring from the adventitia and media of the vessel-walls. Opitz, on the other hand, is of opinion that myomata arise, not from the muscle-fibres, but from the connective tissue, by a process of metaplasia. He argues that as the connective tissue is the undifferentiated representative of the mesenchyme, from which both

the muscle-cells and the stroma of the mucous membrane have been differentiated, it is easy to understand that under certain conditions (in later life) this faculty of muscle-forming metaplasia is again assumed, and circumscribed nodes of fresh myomatous tissue are laid down which form the nuclei of subsequent tumours. Opitz claims to have traced the gradation from connective tissue to muscle in serial sections of small myomata.

Histology.—Myomata are formed of two mesoblastic structures: muscle-bundles and fibrous tissue; the former are arranged transversely and longitudinally, and are bound together by the latter.

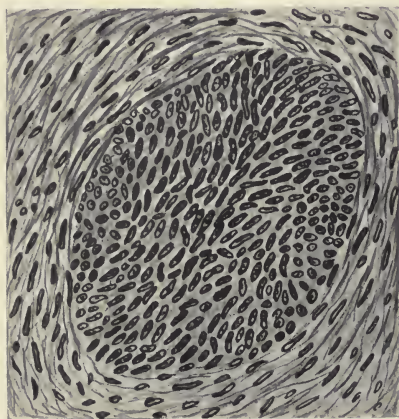


FIG. 85.—Early myoma composed entirely of muscle-cells.

The smallest myomata are composed entirely of muscle. Cullen says that when they attain a diameter of 1 cm. fibrous tissue can be seen. Myomata of microscopical size have no capsule (see Fig. 85), but a lymphatic cleavage (Figure A, Plate VIII.) soon makes its appearance between the tiny growth and the surrounding muscle, and the identity of the new growth is easily made out, even when it is only the size of a pin's head, by the deep staining of the muscle-nuclei, which are far more numerous and more closely

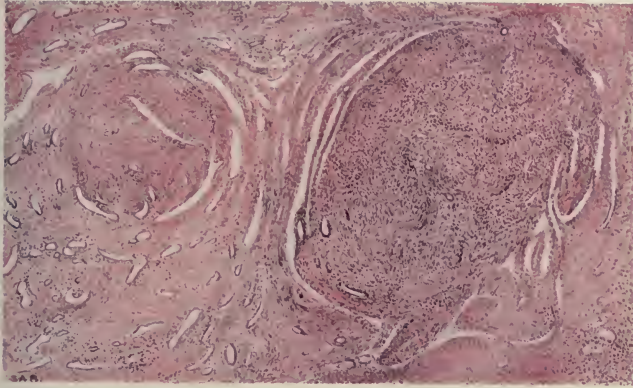
packed together in the growth than in the surrounding muscle. Large myomata always show hyaline degeneration; small ones often do the same.

Individual muscle-cells are spindle-shaped; their nuclei are long, narrow, and rounded at their ends. A muscle-fibre when cut transversely through its centre appears as a spherical mass of protoplasm with a central round nucleus; when obliquely cut, the cell is oval with an ovoid nucleus (Figure B, Plate VIII.); when cut near its end the cell appears as a clear mass of cytoplasm devoid of a nucleus. A muscle-cell has no definite size in length and thickness. Mallory states that the slowest-growing fibres are the most slender, and he classifies the "fibroids" of the clinician under the pathological grouping of *Leiomyoblastomata* (*Leiomyomata*).¹

Leiomyomata are tumours of mesenchymal origin; their cells tend to differentiate into smooth muscle-cells; they occur not only in the uterus, but in the gastro-intestinal tract, in blood-vessels, in the prostate, and elsewhere. *Leiomyomata* generally grow

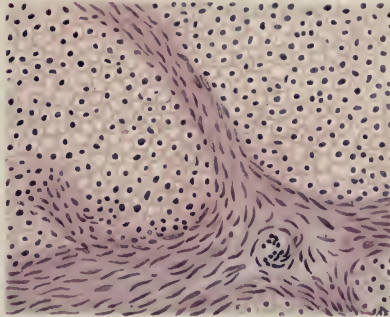
¹ Mallory, *Principles of Pathologic Histology*, p. 305.

A



Two microscopic myomata composed of muscle-fibres only.
Note the peripheral clefts.
1 in. obj. 3 eyepiece.

B



Showing the muscle-fibres of a myoma in longitudinal and transverse section. The spindle-shaped nuclei are connective tissue.
 $\frac{1}{4}$ in. obj. 3 eyepiece.

slowly, but exceptionally they take on rapid growth, and the nuclei of the cells then show mitotic figures, which is a sign of malignancy. The distinguishing feature between a leiomyoma-cell and a fibroma-cell is the presence in the cuticle of the former of longitudinal striations known as myoglia-fibrils, and to these the deep acidophile staining-properties of the muscle-cell are due. At the extremity of the cell these myoglia-fibrils fuse to form a single coarse fibril which terminates the cell (Fig. 86).

The difficulty of distinguishing histologically whether certain myomata are malignant or not is well known, and is best appreciated by those who have worked

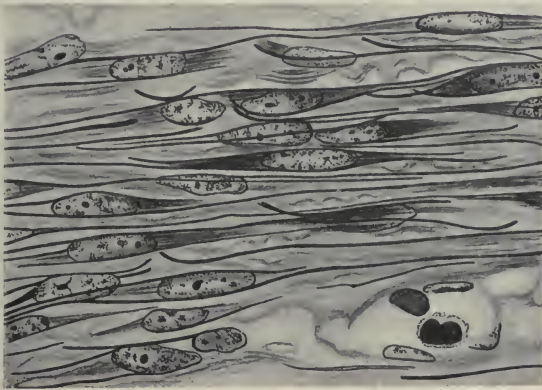


FIG. 86.—Showing a section of a leiomyoma. The myoglia-fibrils are relatively coarse. (Mallory.)

longest at this subject. I have seen metastatic deposits in the lungs and in the pelvic cellular tissues which would pass muster as innocent fibromyomata. There is no doubt that there are some cases in which the histologist, unaided by the clinician, is incapable of giving a reliable prognosis on the question of malignancy. There are, however, two points on which stress must be laid: (1) the clinical and microscopic evidence of rapid growth, (2) the presence of mitosis in the nuclei of the muscle-cells.

If a tumour is growing slowly, there is time for the type-cell to develop, but in rapid growth the myoglia-fibrils may only be formed to a slight extent. In such cases the cells never reach the spindle shape, but may be spherical and sometimes multinucleated. The histological difficulties are often increased by degenerative changes.

A marked histological feature of myomata is their limited blood-supply. Large blood-vessels and lymphatics are found in their capsules, but in the interstices of the

growth the vessels are few and small; the resulting inadequacy of nutrition leads to early hyaline degeneration and also to fibrosis. The latter change is due to the fact that the fibroblast is a hardier cell than the myoma-cell, and goes on proliferating after the myoma-cell has succumbed to malnutrition.

ANATOMY

In size, number, and shape myomata are extremely variable. A 'seedling' myoma is a microscopic object (see Fig. 87) which cannot be detected by the naked eye

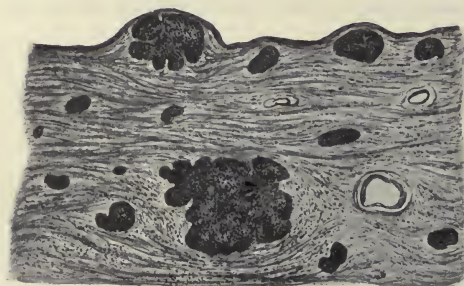


FIG. 87.—'Seedling' myomata in the uterine wall.

or by touch. These tiny growths are round or spherical in shape, and their histological features have already been described. As soon as they attain a size sufficient to render them visible, they stand out as pale whitish bodies, which contrast sharply with the pink uterine tissue by which they are surrounded. When they arise in the uterus they are invariably intra-mural in position. At the start these

growths show a very intimate connection with the surrounding muscle at one or two points, but there is generally a line of cleavage, suggesting the presence of lymphatic channels or of capillary blood-vessels (see Figure B, Plate VIII.). The attached portion is spoken of as the 'pedicle.' Probably no other class of tumours in the body afford such facilities of studying their development from 'seeds' to maturity as do uterine myomata.

As the germinal myoma grows, it acquires a 'capsule,' *i.e.* it becomes more and more definitely distinct from the muscle-tissue of the wall of the uterus, and comes to lie in a loose cellular connective-tissue bed which is characterized by its rich blood- and lymph-supply. This arrangement allows of myomata being easily shelled out, a facility of which the surgeon avails himself in myomectomy. From such a minute origin, myomata may attain to a phenomenal size (180 lbs., Hunter; 89 lbs., Cullen; 47 lbs., Doran). The naked-eye appearances of a healthy myoma are best studied in a freshly-cut section through an interstitial growth.

As soon as the uterus is divided, the pink muscle-tissue surrounding the growth retracts, and the surface of the growth is extruded to a variable degree, standing out with a slight convexity and presenting a whitish surface composed of interlacing whorls which have been likened to a cross-section through a ball of cotton-thread.

This white surface shows no sign of blood-vessels cut across, and, as will be shown later, the myomatous parenchyma is comparatively avascular. The source of nutrition is discovered by examining the layers of the capsule in immediate contact with the growth. Here we find the open mouths of vessels cut at various angles, some obliquely, some transversely, and others longitudinally. The blood-supply

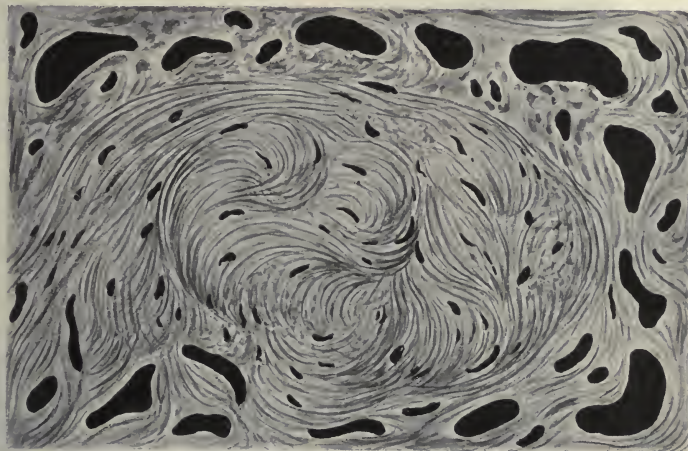


FIG. 88.—A small myoma, with injected blood-vessels. Note the large size of the peripheral vessels and compare their size with that of the vessels in the interior. (After Ribbert.)

is therefore mainly peripheral, and only small vessels reach the interior of a myoma (see Fig. 88).

The relationship of fibrous tissue to muscle, as regards both relative amount and arrangement, is well seen in Figure A, Plate IX.

POSITION AND CLASSIFICATION

Myomata may be classified as corporeal, intraligamentary, and cervical; such a division is mainly clinical. More commonly they are classified according to their position in relation to the uterine wall; thus we have interstitial, subserous, and submucous myomata. Bayle, in 1802, appears to have been the first to classify myomata thus according to their situation. They are most commonly met with in the walls of the body of the uterus, and many writers give the site of election as the posterior wall. Haultain has not found this to be the case, but my own experience is in accord with the statement.

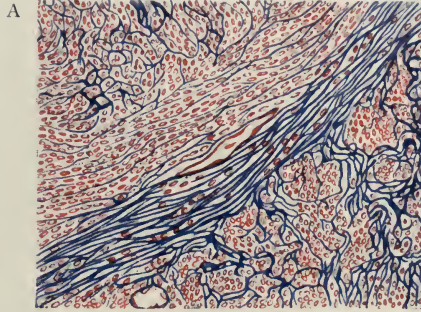
Myomata are relatively infrequent in the cervix, but here they form a class of tumours of great clinical importance. It is extremely common to find interstitial, subserous, and submucous myomata in the same uterus.

Subserous Myomata.—Whatever their ultimate situation, all myomata arise as

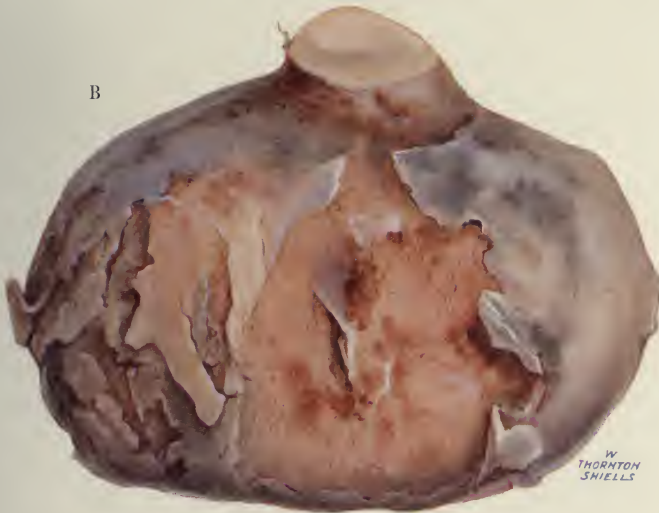


FIG. 89.—Showing (A) sessile subserous and (B) pedunculated subserous myomata. The right appendages have been removed, the left were not taken away. The patient had been treated by X-rays; twelve sittings produced no abatement of menorrhagia, and the tumour increased in size. The right ovary was atrophic, the left one normal in size and appearance.

intramural growths; if they start in the outer muscular layers they take the line of least resistance and push their way towards the serous coat of the uterus, carrying but a thin layer of muscle in front of them, and this stratum of muscle ultimately gives way sufficiently to leave the growth almost entirely covered by the peritoneum. Some subserous myomata remain *sessile* (Fig. 89) with a broad attachment to the uterus and a large segment of the tumour still lying in a vascular bed. Unless the



Section of a myoma, showing the fibrous tissue stained blue, and the muscle-fibres stained red (after Ribbert)



W
THORNTON
SHIELDS

A pedunculated subserous myoma which lay in a bed of omentum near the ileo-colic junction. It is necrotic and had caused fever and pain. The pedicle was short and thick. It is usual, with so short a pedicle, for subserous tumours to shape themselves to the top of the uterus. This tumour lay above the pelvic brim and its weight was taken off the uterus by adhesions acquired in the abdominal cavity.

It shows yellow necrosis in a myoma. The growth was removed from the right cornu, it was enveloped in omentum and adherent to cæcum and appendix.

growth is of great size, it is possible to trace a capsule of muscle-tissue still dividing



FIG. 90.—Subserous myomata, one of which shows torsion of its thin pedicle.

the tumour from the peritoneal investment. Such sessile tumours are often partly subserous and partly retroperitoneal.

Other subserous myomata become so far extruded that their uterine attachment is reduced to a definite stalk or pedicle (Figs. 89 and 90, and Figure B, Plate IX.).

When the pedicle of a subserous growth is very wide, its structure will contain a part of the tumour-tissue. In smaller pedicles, the only muscle they contain is derived from the muscular capsule which the uterus itself provides; the thinnest pedicles of all will be made up only of peritoneum and vessels, and finally this connecting band may be completely severed (see Figure A, Plate XI.).

Pedunculated subserous myomata acquire great freedom of movement, though not so great as that of ovarian cysts, and as in the case of the latter, the pedicle may become twisted (Fig. 90), leading to strangulation of the growth and changes secondary thereto; complete separation from the parent uterus may occur, and a fresh blood-supply from the omentum and other sources may suffice to keep the myoma alive.

Subserous myomata do not as a rule affect the size and shape of the uterus. A common form for these growths to assume—especially the single ones—is that of a kidney with its long axis lying transversely and its concavity overlapping the fundus.

Subserous myomata may be lobulated or smooth. The smaller ones are usually smooth, the larger are often rough and mulberry-shaped (see Fig. 105, p. 221). They frequently present large veins on their surface, and these are often continuous with omental vessels (see Fig. 105, p. 221). These growths are generally hard; they contain scarcely any muscle, but consist almost entirely of badly-nourished fibrous tissue. When they depend upon an extra-uterine source for their blood-supply, they are termed ‘parasitic.’ Subserous myomata may be single, but they are often multiple, producing a congeries of tumours (‘potato-bed’), the like of which is not to be found elsewhere in the human body. As a general rule their size will be found to vary inversely with their number.

Owing to their defective blood-supply, these growths are particularly prone to show every type of retrograde change, for the full details of which the reader is referred to the section, “Secondary Changes in Myomata,” p. 213.

Interstitial Myomata (Fig. 91) remain where they arise, *i.e.* in the muscle-wall of the uterus. They influence the size and shape of the organ to a very marked degree; the cavity is expanded or elongated; the muscularis itself, and often the mucosa as well, are hypertrophied. They can easily be shelled out of a definite bed owing to their loose connection with the uterine wall, through the intervention of a very vascular connective-tissue capsule (see Vol. III. p. 541).

In spite of integrity of the capsule, these tumours are very liable to hyaline degeneration and the other changes which follow in its train, including calcification after the climacteric (see Figures A, B, and C, Plate XV.).

An interstitial myoma which grows uniformly in all directions will result in

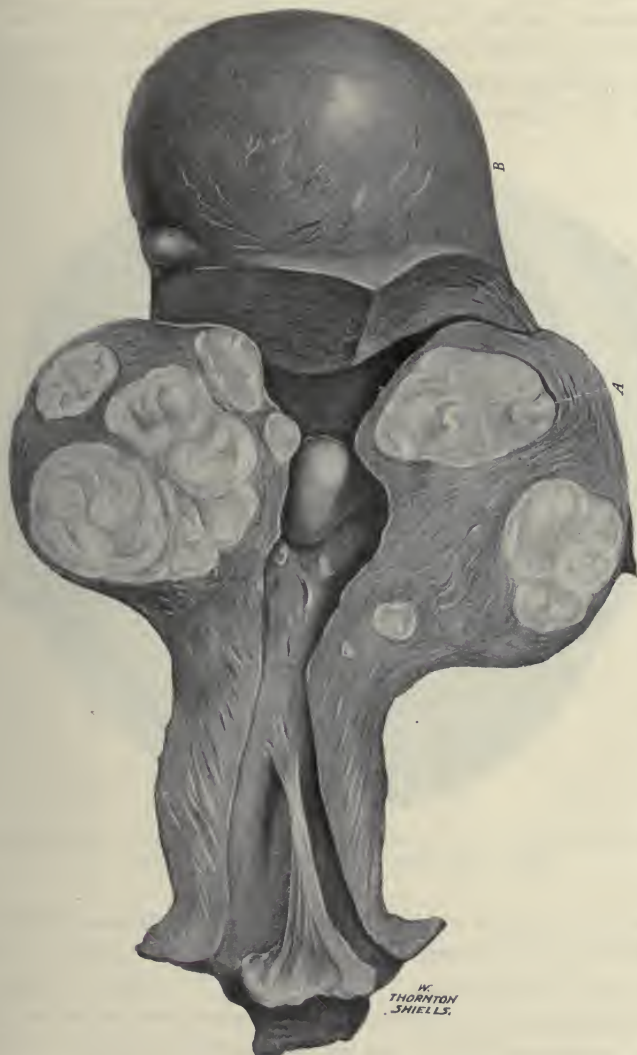


FIG. 91.—*A*, Interstitial myomata; *B*, sessile subserous myoma. A cervical mucous polypus lay in the vagina. A submucous sessile myoma is seen in the cavity of the uterus.

what has been termed a 'cup and ball' myoma. The expanded cavity receives the submucous segment of the growth like a 'cup,' and the serous coat covers the remainder of the 'ball' (see Fig. 92).

Submucous Myomata.—When a myoma develops in the muscle-layers just under the mucosa, it pushes the latter towards the cavity of the uterus. As the tumour increases in size, the mucous membrane becomes atrophic and thinned by stretching and the effects of pressure; this is most marked over the summit or most advanced part of the growth, where it may be found reduced to a homogeneous

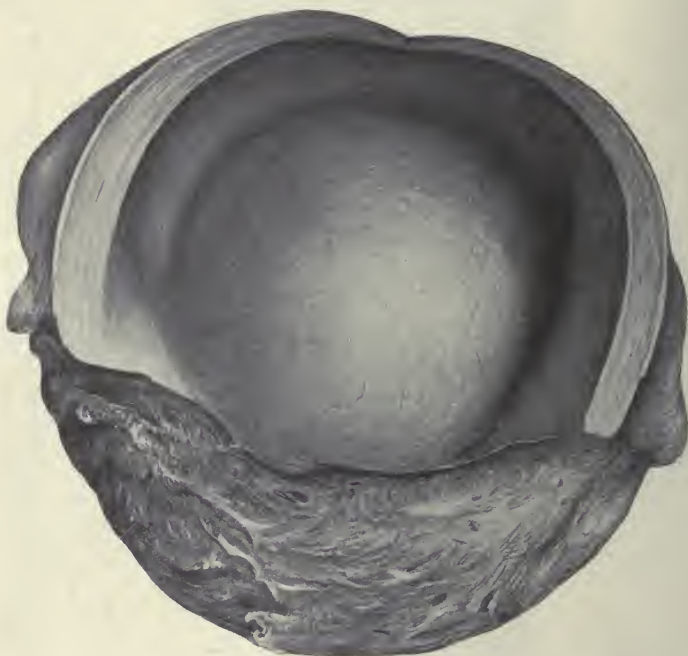
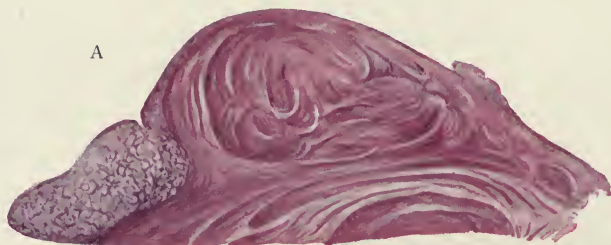


FIG. 92.—An example of the 'cup and ball' myoma. This type of growth often fits the pelvis tightly, and is difficult to elevate prior to removal.

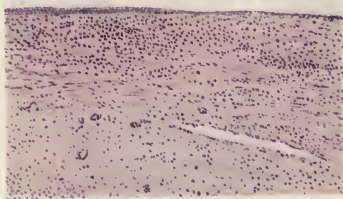
band. When the lower pole of the myoma has suffered extrusion into the vagina, the surface epithelium may undergo metaplasia, and assume the features of squamous epithelium, even to keratinization. Figure B, Plate X. shows the surface of an intra-uterine submucous growth with the endometrium represented by a single layer of low cubical epithelium, which in part has been flattened out almost past recognition, the cell-divisions being lost.

In the recesses or fornices formed by the margins of the growth and the adjacent uterine wall, the mucous membrane is wont to be hypertrophied and



Sessile submucous myoma, showing marked hypertrophy and hyperplasia of the mucous membrane at the margins, and flattening of the epithelium on the surface of the growth. $\times 3$

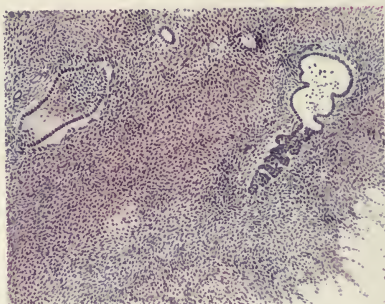
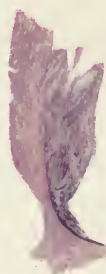
B



Section through the peripheral layers of an intrauterine submucous myoma. The epithelium has become flattened out on the summit of the growth.

$\frac{2}{3}$ in. obj. 3 eyepiece.

C



Shows the microscopic characters of one of many fimbriated polypi which filled the cavity of a uterus. The insert shows the polyp as seen by naked-eye on the microscopic slide.

$\frac{2}{3}$ in. obj. 2 eyepiece.

may become definitely polypoidal. This excessive overgrowth is well shown in Figure A, Plate X.

The tendency of uterine contractions is to express a submucous myoma out of its original bed into the uterine cavity; in this process the growth passes through the sessile stage (where it lies partly in its muscular capsule, and partly covered by



FIG. 93.—Large submucous myoma with a broad attachment to the fundus and back of the uterus.

The lower pole of the growth lay low in the vagina. The cervix has been widely opened up.

mucosa only) and gradually becomes pedunculated. In the smaller growths the pedicle may become reduced to a thin axis of fibrous tissue containing blood-vessels, and this may very occasionally become detached and the tumour be expelled spontaneously (see Figure A, Plate XI.).

The large submucous myomata always maintain a broad attachment, and even when their lower pole reaches into the vagina, they are still quite sessile (see Fig. 93). When the attachment is very wide, the uterus fails to expel the growth, and the cavity then becomes stretched over it and the growth is moulded to the shape of the

cavity itself. I once removed a submucous myoma which had dilated the external os to the fullest extent, so that the diameter of the cervical canal measured 4 inches, and yet there was no extrusion. The growth was cystic, and the lower pole which presented in the dilated os was mistaken for the bag of membranes; and as the



FIG. 94.—Multiple submucous myomata, faceted by mutual pressure.
Eden and Lockyer's *Gynaecology*.

fundus was at the umbilical level, the case was thought to be one of premature labour at the fifth month.

Submucous myomata may be single; on the other hand they may be multiple, or so numerous as to become faceted by mutual pressure (see Fig. 94); more often only one nodule becomes submucous. Sometimes an interstitial growth in the posterior wall will project both ways—outwardly, and towards the cavity. If sloughing of the submucous portion occurs, and the surgeon attempts to remove the growth by morcellement, there is serious risk of perforation of the thin external

uterine wall, which invests the interstitial portion. Such an accident will of course necessitate the removal of the uterus. Pedunculated submucous myomata are usually single; they may be attached to any part of the wall of the cavity; if they arise in the fundus the stalk is often long and thin. The growth itself is



FIG. 95.—Showing total inversion of uterus and vagina produced by a submucous myoma of large size.
(After Barnes.)

usually pear-shaped with the obtuse end downwards. They are completely invested by epithelium derived from the mucosa.

Submucous myomata vary in size from that of a small cherry to that of a six-months' gestation. During menstruation there is a periodic dilatation of the cervical canal; polypoidal myomata may then descend and present at the external os. The growth may recede later. The term 'intermittent polypus' has been employed to describe this phenomenon.

Submucous myomata, whether sessile or pedunculated, may contain tubular gland-spaces, which are no doubt derivatives of the gland-tubules of the endometrium ;

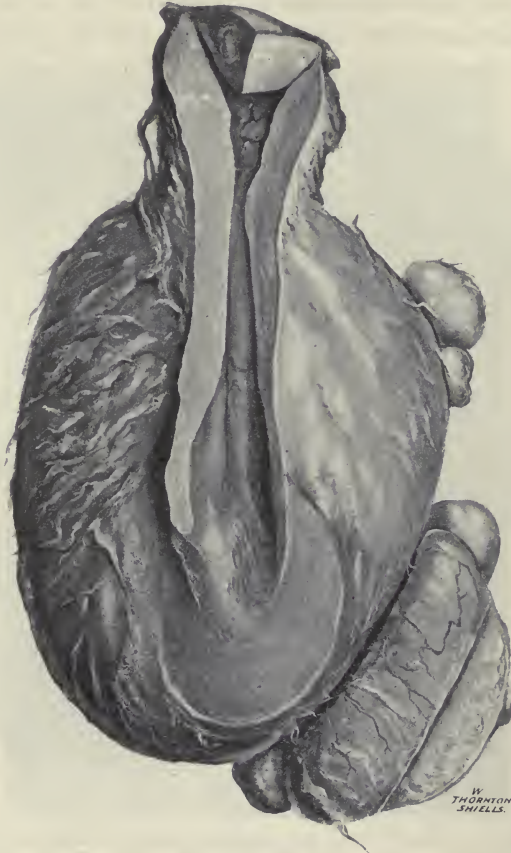


FIG. 96.—'True' cervical myoma, showing elongation of the cervical canal, expansion of the cervix, obliteration of the portio. There are secondary nodules projecting into the left broad ligament; the lower of these displaced the ureter upwards. The duct lay between the two tumour-masses. The uterus has been opened up from the front, and the tumour is seen to occupy exclusively the posterior wall of the cervix.

the usual term *erroneously* applied to them is 'fibro-adenomata' (see Figure c, Plate X.).

Submucous growths are liable to the same secondary changes as the other varieties. From their liability to extrusion, strangulation (see Figures A and B,



A small submucous myoma which was expelled spontaneously.
Natural size.



A submucous myoma, the lower pole of which shows intense congestion and blood-extravasation from pressure of the lower uterine segment and upper part of the cervical canal.

Plate XI.), and exposure, they are much more prone to necrosis and infection than the subserous and interstitial growths. Sloughing, gangrene, and putrefaction are conditions which are practically confined to the submucous variety of myoma. Partially extruded submucous myomata may resemble the inverted fundus, and the



FIG. 97.—Showing a myoma of the anterior cervical wall which has reached large dimensions and elevated the peritoneum in front of the uterus. The appendages encircle the tumour. The right ovary is missing. (After G. Schickele, *Zeitschr. für Geb. und Gyn.* Bd. lxxv. II. 3, Fig. 7a.)

latter has more than once been amputated under the impression that it was a polypoid myomatous growth (see "Diagnosis," p. 278).

Submucous myomata may cause partial and even total inversion of the uterus. The Figure (95), after Barnes, shows that a growth of this kind may even drag the whole vagina outside the vulva.

Retroperitoneal Myomata.—When a myoma arises from the side of the uterus it may extend into the folds of the broad ligament and become an intraligamentary myoma (see Fig. 100, p. 212). In the same way a myoma starting from the back or front of the uterus, below the peritoneal reflexion, may develop in the cellular tissues and ultimately open up the leaves of the broad ligament, although not intraligamentary in position at the start. Such growths, when lateral, displace the uterus to the opposite side, and from their cramped position and inability to ascend, they are wont to cause severe pressure-symptoms. The attachment of intraligamentary myomata to the uterus is sometimes very attenuated, and they may even become entirely separated.

Cervical Myomata.—Cervical myomata are an interesting and rare variety of retroperitoneal myoma; they total about 8 *per cent* of all uterine myomata.

The term 'true cervical myomata' has been given to those which remain interstitial, *i.e.* surrounded by a capsule of cervical wall; they then assume striking clinical features. A tumour of this kind will elevate the body of the uterus, which is otherwise uninfluenced by the growth, so that the normal-sized *corpus uteri* rides on the top of the large egg-shaped cervical growth, like an adrenal on the summit of the kidney (see Fig. 96). The cervical canal is enormously elongated, and the external os is drawn up and expanded to form a slit of variable shape and size. The os may be opened up, with the lower submucous pole of the growth presenting through it. These growths are situated, as a rule, in the *posterior wall of the cervix*, and their anterior aspect is covered in the mesial line by the mucous membrane of the cervical canal.

Myomata which arise from the superficial muscular strata of the cervix and grow out into the cellular tissues are more common than the true interstitial variety of cervical myoma, but they are far less frequently met with than their homologues, the subserous corporeal growth. Secondary nodules may sometimes proceed from the periphery of a true cervical myoma and project into the paracervical connective tissues (see Fig. 96). Such growths are uncommon.

Figure 97 shows an unusual type of myoma. The tumour arises from the anterior wall of both cervix and body. Such growths are *not true cervical myomata*, but they present the same operative difficulties as do retroperitoneal growths confined entirely to the cervix.

Schickele draws attention to the displacement of the uterine arteries by these pseudo-cervical growths (Fig. 98), but a displacement of the uterine vessels is also liable to be caused by the true (interstitial) cervical myomata; in fact it occurs alike with growths which involve the anterior and those which spring from the posterior walls of the cervix. Displacement upwards of the ureters does not

occur in solitary cervical myomata unless secondary nodes develop (see Fig. 96, p. 204). In the case from which the specimen was taken I had to pick up the ureter, take it out of a crevice between the tumour-masses, and draw it outwards, before I could enucleate the secondary nodule which is seen at the lower pole of the growth. For the fuller consideration of cervical myomata, see pp. 283, 284.



FIG. 98.—A pseudo-cervical myoma arising in the anterior wall of both cervix and body of uterus. Displacement forwards of the right uterine vessels. Uterus opened from behind. (After G. Schiekele, *l.s.c.*)

When a retroperitoneal tumour grows from the lower segment of the body of the uterus, where the peritoneum is only loosely attached, it raises the peritoneal fold during its growth underneath; in this way myomata in the posterior wall may displace the peritoneum of the pouch of Douglas, whilst those which arise anteriorly will stretch and elevate the utero-vesical fold and dislocate the bladder. When the growth springs more from the side of the anterior or posterior wall, it will expand the layers of the broad ligament, and may ascend so far as to open up the mesocolon

of the sigmoid flexure on the left, and come to lie under the caecum on the right side of the pelvis.¹

It will be clear from what has already been said that the normal anatomical relations of the uterus can be completely upset by myomata. In addition to displacement to one or other side, and elevation of the body by retroperitoneal growths, the entire *corpus uteri* may undergo partial or complete axial rotation, and, moreover, retroflexion of the body may be a direct anatomical result of a myoma situated in the fundus or posterior wall. In large growths it is common to find the lymphatics and blood-vessels of the broad ligaments enormously dilated, leading to troublesome haemorrhage during enucleation. In cases where a tumour is fed by omental vessels, these structures enlarge in correspondence with the degree of their vicarious function.²

EXTRA-UTERINE MYOMATA

Myoma of the Round Ligament.—Many cases of myomata of the round ligament are recorded in the literature. The earliest I can find is that of Walther, recorded by Virchow. Walther described a whitish-yellow “stone” removed from the right round ligament of a woman aged 36 years; he regarded it as a calcareous myoma and this explanation was accepted by Virchow.³

The next cases on record are two of Spencer Wells in 1865.⁴ The diagnosis of an epiplocele was made in the first case, and that of a tumour of the lymphatic glands in the second. In both instances, after operation the tumours were regarded as ‘fibromata’ of the round ligament; the one was the size of an orange and the other the size of a bean. This was the first time that growths of the round ligament had been removed by operation.⁵

Figure 99 shows a myoma developing from the muscularis of the round ligament. The specimen was removed by vaginal hysterectomy; it shows the body of the uterus to contain multiple interstitial myomata becoming subserous, and two extra-uterine myomata in addition—one, the size of a pigeon’s egg, is springing from the round ligament of the right side. The ligament is shown flattened out; this flattening was produced by the pinning out of the appendages, which was necessary to show the proper relations. The right ovary lies behind out of sight, but alongside the round-ligament tumour there is seen a small fimbrial cyst with the pedicle of the infundibulo-pelvic fold retracted over its upper border. The tumour, which is

¹ For the clinical importance of retroperitoneal growths see “Myomata and Pregnancy,” p. 249.

² For the anatomical changes accompanying visceral displacements and adhesions see special headings.

³ *Die Krankhaften-Geschweülste*, Bd. iii. S. 222.

⁴ *Brit. Med. Journ.*, 1865.

⁵ Emanuel, *Zeitschr. für Geb. und Gyn.* Bd. xlviii. S. 383.

lying free by the side of the cervix, lay in the paravaginal tissues beneath the pouch of Douglas, and displaced the cervix to the left. It bulged so much through the upper half of the vaginal wall that the cervix was not easily reached.

In my experience myomata of the round ligament are rare, and are confined either to the proximal end, or to that part of the ligament which lies in the canal of Nuck; when they arise in the latter situation it is very difficult to demonstrate their relationship, and many clinicians speak of this class of neoplasm as arising from the musculature of the abdominal parietes, whilst others regard them as fibromata, and claim that they originate in the fascial aponeuroses of the flat abdominal muscles. Having demonstrated unstriped muscle in these growths, and having found a fibromuscular cord resembling the round ligament flattened out, running into one of these growths, I feel myself in a position to confirm the view that the segment of the round ligament in the canal of Nuck is a site of origin for myomata.

Of the three cases of myomata in the canal of Nuck which I have seen and examined at the Samaritan Hospital, one was the size of a hen's egg, one corresponded in size to a small Tangerine orange, and one to a pigeon's egg.

Myoma of the Fallopian Tubes.—Solid tumours of the oviducts are rare. The only case of tubal myoma which I have seen, was one in which two myomatous nodules on the right tube were diagnosed as moniliform tuberculous salpingitis. The growths were quite small (2 cm. and 1 cm. respectively in diameter); they were both in a state of hyaline degeneration, and the larger of the two contained calcareous deposit.

Myoma of the Broad Ligament.—The origin of myomata from the attenuated muscle-sheath in the broad ligament is very difficult to prove. True uterine myomata in this situation are sometimes only attached to the uterus by a thin band of muscle-tissue, and it may be argued that this attenuation may lead to complete separation of the growth from its site of origin in the uterus. I have shelled out a myoma from the left broad ligament which had no apparent attachment to the uterus. It was the size of an orange, and when it had been removed, the ovary, Fallopian tube, and round ligament were intact.

Myoma of the Recto-vaginal Septum.—Figure 99, p. 210, shows an extra-uterine myoma placed in the drawing to represent as nearly as possible its clinical relationship to the broad ligament and cervix. The illustration represents the actual size of the specimen. The cervix was deflected to the left by the growth; the latter lay in a cellular bed between the posterior vaginal wall and the rectum, and extended into the base of the right broad ligament. It was very adherent in places, and its enucleation was consequently difficult. Histologically it was a fibromyoma.

Myomata of the Vaginal Wall.—Myomata in this situation are rare. I have met with only one case of vaginal myoma: the patient, 52 years of age, was sent to the Great Northern Hospital with the diagnosis of cancer of the body of the

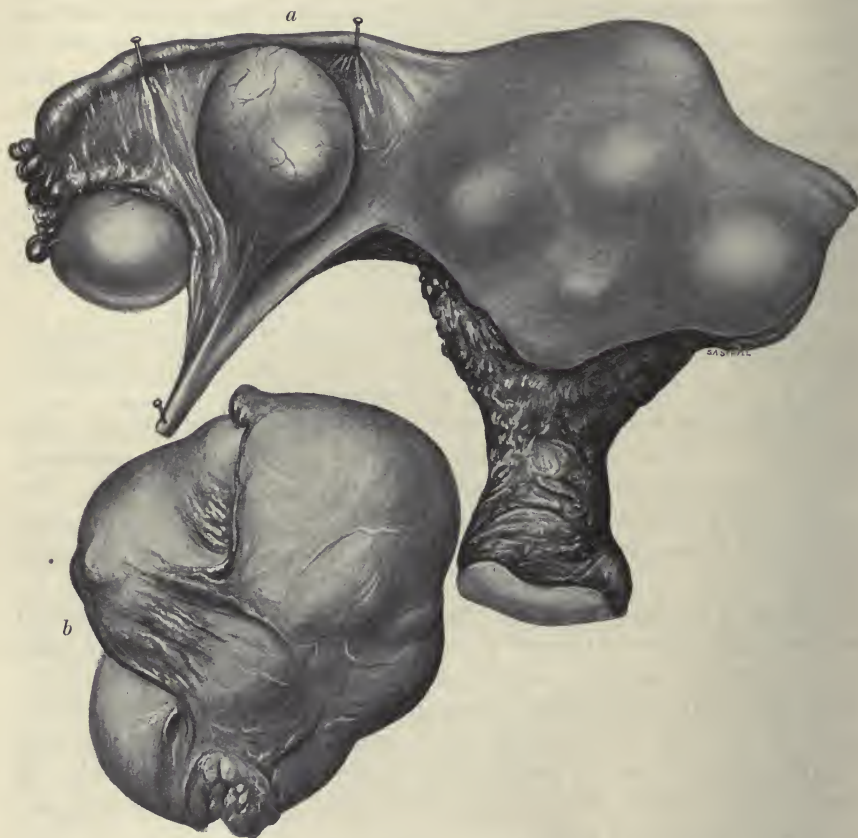


FIG. 99.—*a*, A small myoma attached to the right round ligament; *b*, the lower figure represents a myoma which was enucleated from the recto-vaginal septum (see Text).

uterus. The predominant symptom was metrorrhagia. In the right fornix and some distance from the cervix was a sessile submucous growth which shelled out quite easily. It measured 2×2 cm. and was reported by Ernest H. Shaw, the pathologist, to be a "simple myoma"; the uterus was curetted and found not to be the seat of malignant disease.

Simple solid mesoblastic tumours of the vulva and introitus vaginae are usually devoid of muscle and should be classed as fibromata.

CHANGES IN NEIGHBOURING STRUCTURES

The Fallopian Tubes.—In the majority of cases the anatomical relations of the tubes are unaltered, but when the myoma extends outwards into the broad ligament, the corresponding tube is stretched over the top of the growth, just as it is in the case of a broad-ligament cyst (see Fig. 100). In this way the tube may be elongated to double its normal length.

A sessile subserous growth situated at the cornu may upset the adnexal relations at this point, as a case published by Alban Doran clearly showed.¹

The Round Ligaments.—These are usually found to be hypertrophied, and are often lengthened in cases of large intraligamentary myomata; they form a characteristic anatomical picture, as they traverse the top and front of the tumour, from the cornu to the internal abdominal ring. When the uterus is much displaced, one round ligament may be seen reaching from one side of the pelvis to the other, whilst its fellow is out of sight. The position of the round ligaments is a good indication of the presence, and amount, of axial torsion of the corpus uteri.²

The Ovaries.—These organs are frequently found to be enlarged in cases of myoma uteri, and in 934 cases examined by Cullen the ovaries were normal in only 438.

There is no evidence, so far as I know, to show that enlargement, when demonstrable, is due to hyperplasia or a definite increase of active ovarian tissue. In many instances it is no doubt accounted for by oedematous infiltration.

The *position* of the ovaries is liable to great variation in the different types of myomata. They may be dragged down owing to retroflexion of the uterus caused by an interstitial fundal growth, or by a subserous tumour springing from the back of the uterus. They may be compressed between two lobes of one and the same growth; definite fusion of a myoma and an adjacent ovary is mentioned by Kelly and Cullen. Again, these organs may be raised above the pelvic brim by large intraligamentary growths, and they may come to lie in the antero-posterior axis of the body and even undergo strangulation in torsion of the uterus.

Broad Ligaments and Vessels.—The broad ligaments are opened up by myomata extending outwards from the sides of the uterus, and by myomatous

¹ Doran and Lockyer, *Trans. Obstet. Soc. Lond.* vol. xliii. p. 272.

² For myomata of the round ligaments see "Extra-Uterine Myomata," p. 208.

tumours arising from the fibro-muscular tissue in the ligaments themselves. In the

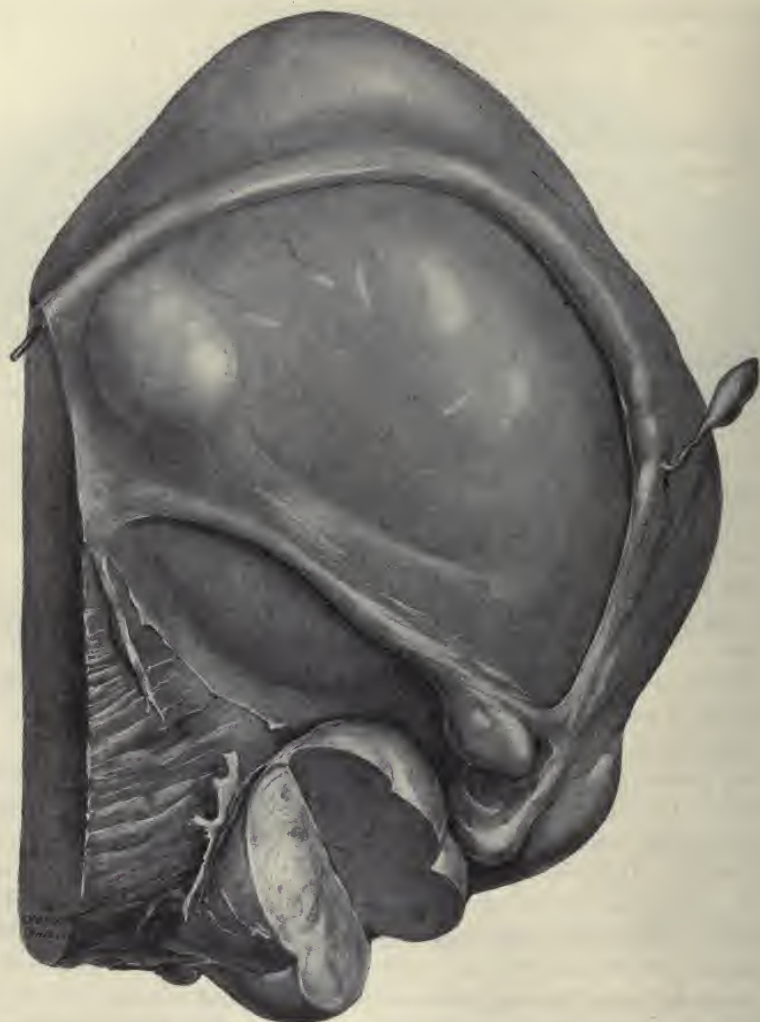


FIG. 100.—Showing the Fallopian tube (with a pointer in its lumen) stretched over an intraligamentary myoma. The ligament of the ovary is seen to be almost twice its normal length. This is the upper aspect of the cystic myoma shown in Plate XIV.

case of large tumours, the separation of the folds may be so complete that the meso-

salpinx disappears, and the Fallopian tube lies in the peritoneal capsule of the growth in actual contact with its surface (Fig. 100), just as does the round ligament.

The vessels—uterine and ovarian—in the broad ligaments, being the channels of nutrition to the myomatous uterus, are frequently found to be much increased in size, and in axial rotation of the uterus, the uterine vessels lie in front of, or behind, their normal position (see Fig. 100, p. 212). The lymphatics are frequently found dilated, and the cellular tissues infiltrated by oedema in cases of large fibromyomata.

SECONDARY CHANGES IN MYOMATA

Largely owing to the disparity between the size of myomata and their blood-supply, these tumours are extremely liable to degenerative changes, which may be enumerated as follows :

1. Atrophy.
2. Hyaline degeneration.
3. Cystic degeneration.
4. Calcareous degeneration.
5. Fatty degeneration.
6. Necrobiosis.

To these must be added :

7. Circulatory Changes :
 - (1) Oedema and Lymphangiectasis.
 - (2) Axial Rotation leading to—
 - (a) Congestion.
 - (b) Interstitial haemorrhage.
 - (c) Necrosis.
 - (d) Detachment of tumour.
8. Angiomatous or Telangiectatic Changes.
9. Infective Changes leading to—
 - (a) Inflammation.
 - (b) Suppuration (localized abscess).
 - (c) Gangrene and Sloughing.

And finally :

10. Malignant Changes :
 - (a) Sarcoma (malignant leiomyoma).
 - (b) Perithelioma.
 - (c) Endothelioma.

Atrophy.—This is a change to which further allusion will again be made in the reference to oöphorectomy (see p. 291), which was for some years practised for the treatment of myomata, at a time when the mortality for hysterectomy was something like 20 per cent.

With the cessation of the ovarian function after the climacteric, a certain number of myomata undergo spontaneous atrophy and consequent reduction in size, and instances have been recorded of the total clinical disappearance of these growths. We have no knowledge as to the proportion of the cases in which this occurs, but I agree with Eden in thinking that it is probably much rarer than was formerly supposed, and that it must not be regarded as an ordinary, but as an exceptional sequence of the menopause. There is no doubt, however, that marked atrophy of myomata has followed in many cases of total oöphorectomy.

The influence of X-rays in producing atrophic changes and shrinkage in myomata is very variable. I have seen a myoma in a woman of 45 years become half as large again after twelve sittings and during five months' observation. Figure B, Plate XII. shows advanced hyaline degeneration in a myoma which had been treated by X-rays over a period of several years, and which became reduced in size but had to be removed for ovarian complications and adhesions. Experience with several other cases has made me sceptical as to the ability of X-rays to produce permanent atrophy in myomata.¹

Hyaline Degeneration.—This is the first change to take place in a myoma as the result of malnutrition. It is excessively common in every type, wherever situated—in fact the majority of myomata show this change.

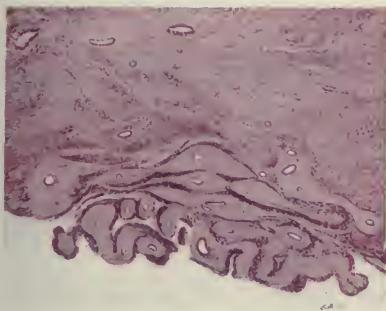
The consistence of myomata which have undergone hyaline degeneration is very variable. Tumours which are extensively involved may be hard or soft, pulpy or succulent. The so-called *myxomatous change* is best regarded as the liquefactive stage of hyaline degeneration, since the 'mucinoid' fluid does not give all the reactions of mucin and is very different from pseudo-mucin. Hyalin gives no definite chemical reactions; it is a substance which even in its physical or histological characters is very variable, but before liquefaction commences a hyaline area presents as homogeneous material, devoid of nuclei and staining deeply with eosin.

The distribution of hyalin is very variable indeed. In most cases it would seem that the fibrous tissue is the first to be attacked, and islands of muscle-bundles are left with their characters preserved. In such isolated muscle-bundles the cells are seen to be swollen and they may fuse together, while their nuclei become broken up into granular fragments of cytoplasm, and ultimately disappear. The nuclei

¹ This point is more fully discussed in the Article on Radio-Therapeutics, Vol. III. p. 836.—EDITORS.

PLATE XII. Vol. II

A



Showing hyaline change which is most marked in the blood-vessels.

$\frac{3}{8}$ in. obj.
2 eyepiece.

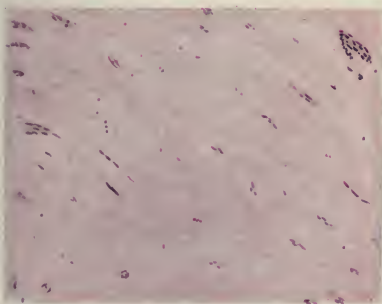
B



Advanced hyaline degeneration in a myoma treated by X Rays. The yellow areas are muscle-fibres in transverse section, which have escaped destruction. Van Gieson.

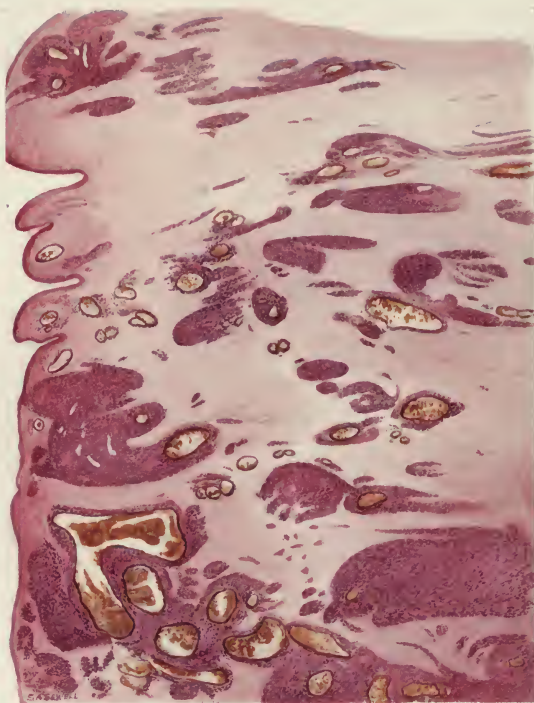
$\frac{3}{8}$ in. obj.
2 eyepiece.

C



Extensive hyaline degeneration in a myoma also treated by X Rays. There are indications of a few fragmentary muscle-bundles, but often only the nuclei of the muscle-cells remain.

$\frac{3}{8}$ in. obj.
2 eyepiece.



Advanced hyaline degeneration. Blood-vessels and patches of muscle lying in spaces where commencing liquefaction has destroyed the characters of the surrounding tissue.

2 in. obj. 3 eyepiece.

are the most resistant part of the muscle-cell, and sometimes they may be seen stained with logwood, in a red homogeneous hyaline area, as the last representatives of the muscle-bundles which have disappeared (see Figure c, Plate XII.).

As a rule the vessel-walls resist this change to the very last, so that blood-vessels may be seen lying free in spaces where commencing liquefaction has completely destroyed the character of the surrounding tissue (Plate XIII.). But there are occasional exceptions, and Figure A, Plate XII. shows myomatous tissue in which the change seems to have started as a blood-vascular degeneration and to have spread from the vessel-walls into the tissues.

To the naked eye, a hyaline area presents a whitish-yellow appearance, but the whorled aspect of the growth is not destroyed. Cullen says he has seen such an area resembling fat; and this I have also noticed. Any colour seen macroscopically in a hyaline area is due to blood-changes which are quite common at the periphery of the degeneration. The transition from the solid homogeneous hyaline tissue to areas of liquefaction affords the most strikingly beautiful pictures in histological research. Sometimes the demarcation between healthy tissue and liquefaction is abrupt, and cyst-walls with tense homogeneous linings are formed; more commonly the liquefaction is gradual, and the tissues become less and less dense, more and more rarefied, until nothing is left but the space occupied by the fluid. In these cases the cysts have ragged walls, with here and there a blood-vessel cut transversely, and lying free. Wherever a vessel is seen, there is a bit of adjacent nucleated tissue in its neighbourhood, still clinging to life, and subsisting from the fact of its proximity to the source of nutrition. Figure c, Plate XII. shows hyaline degeneration in a myoma which shrank while under treatment by X-rays. There is one muscle-bundle seen in the right-hand upper corner of the drawing, but most of the muscle-tissue is represented by nuclei only.

In my own experience it has often been the case that malignant (sarcomatous) changes originate in the vicinity of hyaline areas (see Figure B, Plate XXI.).

Cystic Degeneration.—From what has already been stated, it will be seen that cystic change is nearly always preceded by hyaline degeneration. As the result of liquefaction of the hyaline deposit, cysts are formed which vary in size and shape according to the extent of the hyaline areas. The cavities thus produced are not true cysts, that is to say, they have no endothelial lining. Their walls are composed of hyaline tissue which has not as yet undergone liquefaction. The spaces enlarge by the spread of the liquefaction and by the breaking down of trabeculae between small cysts.

Reference has already been made to the irregular distribution of hyaline degenera-

tion in myomata—how it sometimes spreads in a trabecular manner throughout the tumour, whilst in other cases large continuous or concrete areas of hyaline change are met with. Sometimes the degeneration is seen only in patches; in rarer instances it seems to involve the whole tumour simultaneously. This variation in distribution of hyaline degeneration will account for the different types of cystic change which

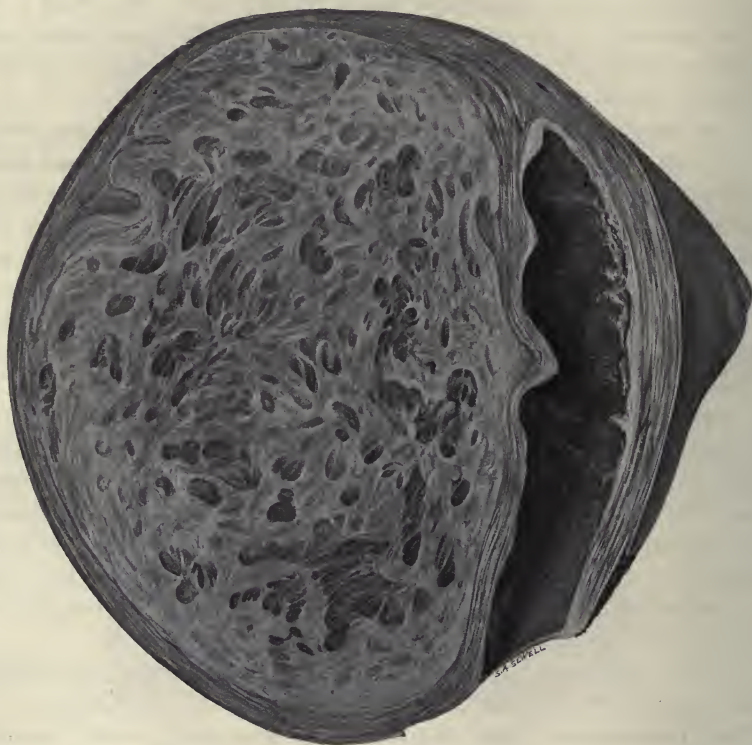


FIG. 101.—Showing a soft interstitial myoma of the posterior uterine wall. The growth is undergoing multiple cystic change as a result of trabecular hyaline degeneration.

the subsequent liquefaction produces. In Figure 101 we see the results produced when liquefaction follows on diffuse trabecular hyaline change which has affected a whole tumour. We then have a congeries of tiny cysts, which, when the trabeculae give way, will produce large cystic spaces.

Figure 102 shows an advanced stage of the same process. The specimen is a submucous myoma removed by vaginal myomectomy. It shows multiple cysts

which have fused together owing to liquefaction extending to, and destroying, the intervening septa. The walls are smooth internally, owing to the pressure of the fluid within the cysts—a pressure which no doubt was considerable, and due in large



FIG. 102.—Showing a cystic submucous myoma removed by vaginal myomectomy through a fully dilated cervix. The case was diagnosed as one of pregnancy at 5½ months.

measure to the contractions of the uterus, since there was full dilatation of the cervix before the removal of the growth. In the preceding Figure 101, the finer trabeculae not being destroyed completely, the walls of the spaces are ragged or fringed.

Plate XIV. is another example of diffuse liquefaction of a hyaline myoma.

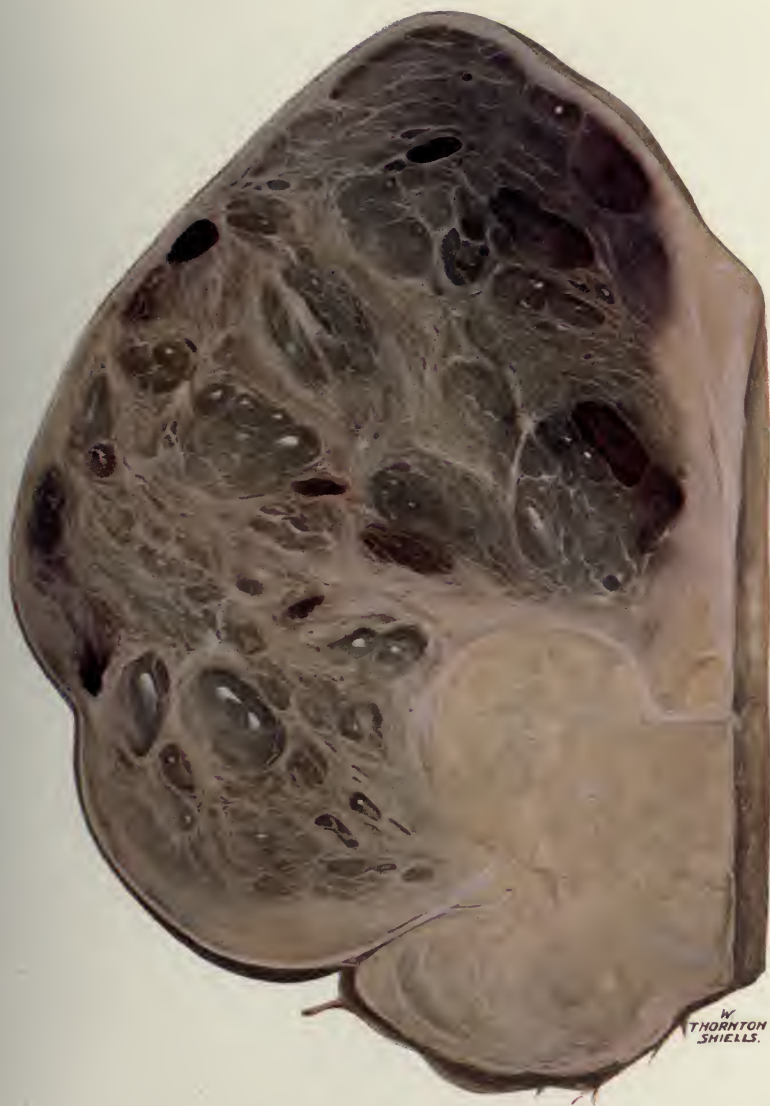
It is a beautiful example of the fusion of tiny cysts to form larger ones. The tumour is a broad-ligament myoma, the external view of which was shown in Figure 100, p. 212. It will be seen that three-fourths of the growth have become cystic, whilst the soft remainder retains the characteristics of hyaline tissue. The fine trabecular



FIG. 103.—An intramural myoma which has undergone diffuse uniform hyaline change, succeeded by diffuse liquefaction. This process would have terminated in the formation of a large unilocular cyst with smooth walls.

arrangement is well seen, and on cutting the tumour in half, the cysts collapsed, owing to the escape of their thin blood-stained contents. This caused the cut surface to become deeply concave, so that the centre of the growth subsided for nearly one inch below the peripheral margin. On immersion in glycerine the cysts filled up again, just as a sponge does in water, and the growth then presented the appearance seen in the drawing

This specimen brings out another characteristic point in cystic degeneration,



W.
THORNTON
SHIELLS.

Showing an intraligamentary soft myoma, three-fourths of which have become cystic. There is no doubt that in process of time the intracystic trabeculae would have been absorbed, and the result would have been a single large cyst with ragged walls.



FIG. 104.—Showing an intraligamentary myoma which has undergone complete cystic change.
The tension of the blood-fluid has reduced the capsule of uterine muscle to a thin shell.

viz. its effect on the blood-vessels, some of which become thrombosed, whilst allowing of the escape of blood-pigment which stains the contents of a number of the cysts.

This is the kind of change to which the name 'myxomatous' has been applied, but I have already given reasons for discarding this term, and for regarding the cystic change as due to liquefaction following on diffuse hyaline change.

Figure 103 shows a myoma which is undergoing a type of liquefaction which is even more diffuse than any of the preceding. Trabeculae are not even seen. The lighter areas show hyaline tissue in which the liquefactive process is not so far advanced. The ultimate result would have been that the entire tumour would have become one large cystic cavity, with smooth walls, no solid elements of the tumour being left. The manner in which the muscular capsule (composed of uterine wall) has escaped the change is strikingly shown in the drawing. Figure 104 shows a specimen in which this complete cystic change has taken place, producing a thin-walled cyst which contained fluid resembling blood, but which showed no tendency to coagulate after standing for many months. The fluid was entirely devoid of leucocytes and fibrin-ferment.

It is far more usual to meet with *localized* cystic formation than to find the liquefaction so diffused as it is seen in the foregoing illustrations. Subserous, and especially perhaps subserous pedunculated, myomata are the types of growths which afford the best examples of discrete cysts. Even here the formation of the larger cystic spaces is produced by the fusion of smaller cysts. This is clearly seen in Figure 105, which shows amongst other interesting pathological conditions a pedunculated cystic myoma opened up to demonstrate multiple cystic spaces intercommunicating through the breaking down of intervening septa. The same trabecular arrangement is seen in the wall of the larger cyst in Figure 106. From the presence of these trabeculae it would seem clear that the cyst was the result of the fusion of many smaller ones. This drawing shows also another feature already alluded to, viz. the presence of thrombosed vessels in the neighbourhood of these cystic spaces. The marked tendency of these badly-nourished pedunculated growths to hyaline change has already been mentioned. It is due to this fact that cystic changes are likewise seen in these tumours.

The fluid-contents of cysts produced by liquefaction of hyaline areas vary considerably. The liquid is commonly straw-coloured and highly albuminous. It may coagulate spontaneously, but that which is obtained from the larger cysts remains fluid. It is not uncommon to find the fluid coloured by blood-pigment, so that it may be turbid, greenish-brown, red or reddish-brown.

Cystic degeneration is not always due solely to liquefaction of hyaline areas. It



FIG. 105.—Showing a uterus removed by 'high amputation' (Doran), and presenting a parasitic pedunculated myoma with typical mulberry surface. Also a cystic pedunculated myoma which shows multiple trabeculae, which are breaking down. The adnexal tumour on the right is an ovarian fibroma.

follows necrobiosis, and when one meets with extensive cystic change such as that seen in Figure 104, p. 219, where the contents resembled fluid blood, it is hard to say what were the antecedent conditions, especially as thrombosis of peripheral vessels is present both in hyaline liquefactive areas and in red necrosis. The presence of fat-globules in the muscular wall of the cyst would favour preceding necrobiosis.

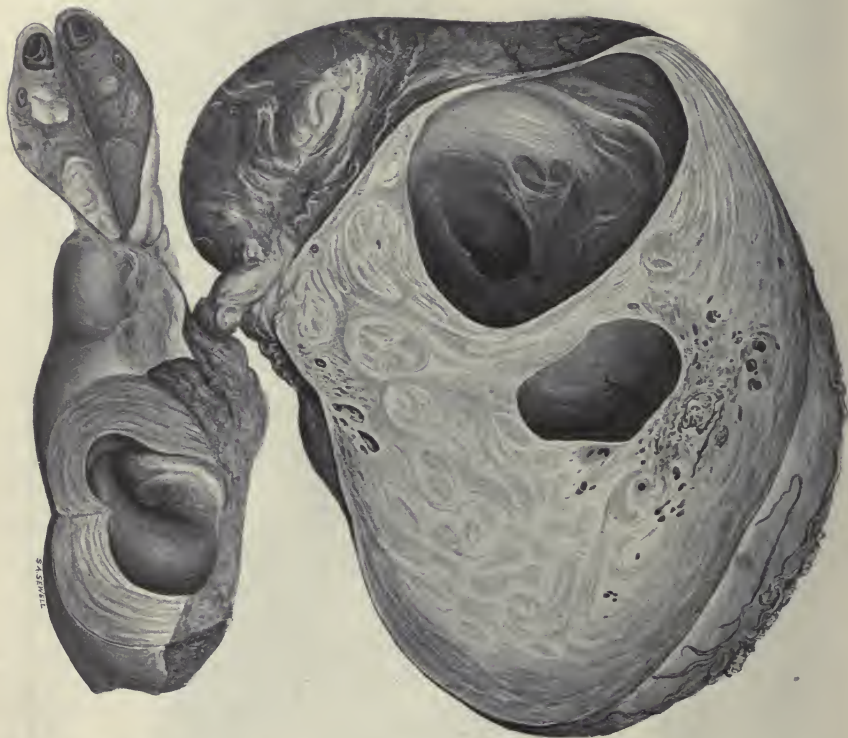


FIG. 106.—Showing a uterus removed by 'high amputation' (Doran). There is a pedunculated myoma containing two cysts. The upper and larger cyst presents the remains of a trabecular arrangement showing that many small cysts have fused to form one large cyst. The lower and smaller cyst is partly surrounded by multiple thrombosed vessels, many of which showed commencing peritheliomatous change.

We may conclude that the majority of cysts found in myomata are *pseudo-cysts* of the nature described above. Far less frequently we meet with *true* cystic spaces lined with endothelium. In my investigations I have never found any of large size; they have all been due to dilated lymphatics, and are most commonly

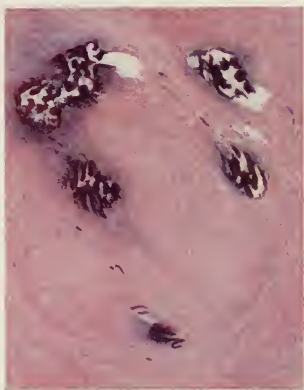
PLATE XV. Vol. II

A



Showing a thin shell of cal-
careous degeneration around a
myoma which has undergone
red necrosis.

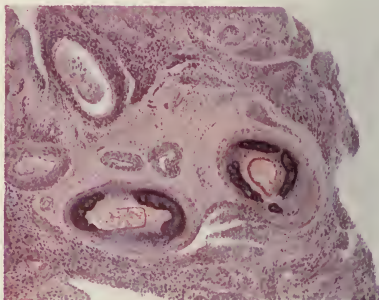
B



Showing calcareous nodules in a hyaline
area.

2 in obj. 3 eyepiece.

C



Showing calcareous deposits within arterial
coats.

2 in. obj. 3 eyepiece.

seen in association with oedema. Probably the lymphangiectasis is a concomitant of oedema; at any rate I have not found it apart from that condition.

Calcareous Degeneration.—The chemical nature of this process was worked out by Klotz. He found that preceding the deposition of calcium salts, fatty changes occur in the tissues; then soapy substances are formed, which unite with the albumens of the dead cells to form soap-albumens. These form insoluble double calcium-soaps with calcium derived from the blood; finally, by combining with CO_2 and PO_4 , carbonates and phosphates of lime are deposited as insoluble salts in the dead tissues. Cullen further points out that lime-salts have been found around the points where electrodes have been introduced into a myomatous tumour.

Calcareous degeneration in myomata may affect the periphery of the growth only, producing a shell-like investment (see Figure A, Plate XV.), or the deposit may be diffused throughout the whole substance of the tumour, producing the so-called "womb stone." The deposit of lime-salts is fairly common after the menopause, but it may also occur during the period of fertility.

The chalky areas, as seen through the peritoneal coat of the tumour, appear as yellowish craggy nodules, and are easily recognized, when near the surface, by their stony hardness. Small calcareous points are frequently seen in hyaline areas (Figure B, Plate XV.); the salts stain deeply with haematoxylin. In a few instances I have seen deposits within the arteries contained in myomatous tissue (Figure C, Plate XV.). In Figure 108, p. 232, there is a ring of calcified tissue intervening between the myomatous and sarcomatous areas. Hyaline, fatty, and calcareous changes seem to be intimately associated, due to the fact, no doubt, that, pathologically speaking, lime-salts are only deposited in dead tissues.

Subserous, interstitial, and submucous myomata may become partially or wholly calcareous; in the subserous variety the calcified growth may be found entirely separated from the uterus. I discovered one such, adherent to the parietes close to the umbilicus and embedded in omentum; and in another case the calcified tumour was adherent to the back of the left broad ligament underneath an endometriomatous ovary.

Clinically speaking, calcareous myomata are generally of little importance; nevertheless they are not altogether safe from infection and other changes, as a case recorded by Carter shows.¹ Calcified myomata of the submucous type may be expelled either by a process of sloughing or by dilatation of the cervix.

Calcification in a myoma can be detected by the employment of X-rays.

Fatty Degeneration.—The majority of myomata, large and small, show hyaline

¹ *Trans. Obstet. Soc. Lond.* vol. xiii. pp. 167-168.

change; the same cannot be said of fatty degeneration: there is a big jump, so to speak, in the sequence of happenings, between hyaline and fatty change. What concomitant factors are brought into play at this point? It would seem to be a local cause which determines the fatty change, since it may be confined to but one tumour in a group of myomata, and, moreover, to a single area in the growth affected.

Defective blood-supply produced by local thrombosis suggests itself. Lorrain Smith and Fletcher Shaw speak of thrombosis as *delaying* the absorption of fat, and in certain instances, at all events, *i.e.* where thrombosis is evident, it is fair to assume that it has been the cause of the impaired nutrition which has resulted in the *deposition* of fat. Fatty degeneration of myomata is an invariable accompaniment of necrosis.

Lipoid, either in the form of lipoid-fat or lipoid-soap, is a product derived from the muscle-fibres, which first become granular, then hyaline, and finally fatty; thus we speak of granular and hyaline *degeneration* and fatty *necrosis*. It is probable that this constitutes the natural sequence of events, so that we should not expect to find a muscle-fibre becoming fatty in the absence of granular or hyaline change.

The macroscopic appearance of fat in a myoma is variable, being influenced by associated conditions due to changes in the blood. The cut surface of a fatty myoma may be pale yellowish in colour, but it is often tinted by soluble blood-pigment. The normal whorled appearance may be obscured and the surface is homogeneous (Figure A, Plate XVI.). The consistence will vary with the degree of degeneration; the more fat laid down, the softer the tissue becomes. Engorged vessels may, or may not, be seen.

Microscopically, many of the changes already mentioned under "Hyaline Degeneration" will be found, and it may be taken for granted that these are antecedents. We thus have:

- (1) Irregular and scanty nuclear staining;
- (2) granular and hyaline change;
- (3) fat-globules running in the original direction of the muscle-fibres (see Figure B, Plate XVI.);
- (4) fat within wandering phagocytes, both outside and inside lymphatics;
- (5) signs of vascular degeneration, engorgement, thrombosis, and fibrin-deposition in the vessels.

For a further consideration of this subject the reader is referred to the section dealing with "Red Degeneration."

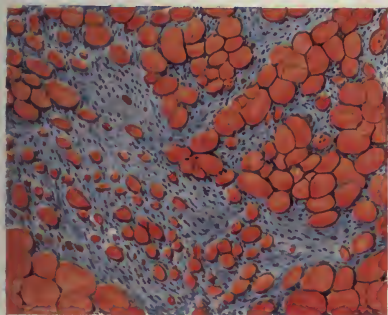
The finding of fat, however, is not always a sign of degeneration in a myoma; it is also present in certain rare cases of vital but depraved activity, and constitutes by its presence a distinctive neoplasm, called by those who accept this view *lipomyoma* or *fibro-lipomyoma*, whilst more cautious authorities prefer the nomenclature *lipomatosis* as descriptive of the condition.

A



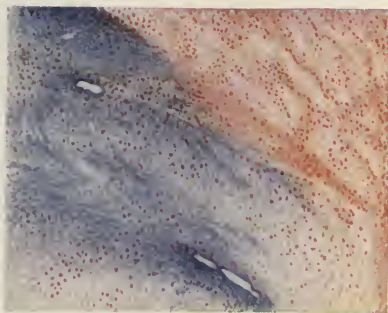
Cut surface of a myolipoma.
(Maxwell & Ley.)

B



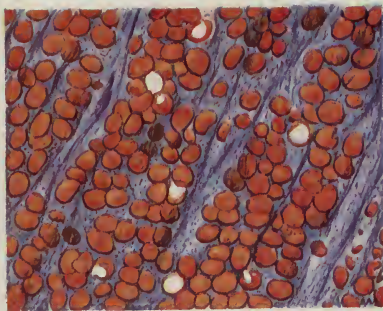
Fatty myoma stained by Sudan III. (Maxwell & Ley.)
 $\frac{3}{8}$ in. obj. 3 eyepiece.

C



Fatty degeneration as seen in a red myoma.
 $\frac{1}{4}$ in. obj. 2 eyepiece.

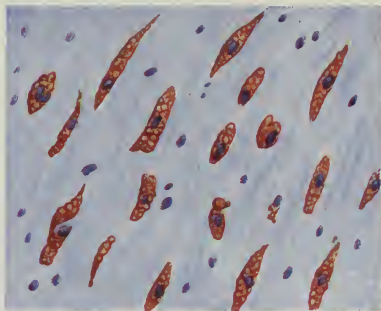
A



Showing large fat-globules lying in columns corresponding to the original direction of the muscle-bundles.

$\frac{3}{8}$ in. obj. 3 eyepiece

C



Showing fatty globules within fragments of muscle-fibres. The nuclei of the cells still persist.

$\frac{3}{8}$ in. obj. 2 eyepiece

B



Shows a sagittal section of a uterus containing a corporeal and a cervical myoma. The latter is fatty throughout, but the whorled arrangement of the fibromyomatous stroma is in part preserved.

An example of this rare 'tumour' was recently removed from a patient at the London Hospital, by Drummond Maxwell, and has been published by Gordon Ley.¹ These gentlemen have kindly given me permission to include their account of this specimen in this article, and it is placed here under "Fatty Degeneration" solely for purposes of convenience.

The specimen was removed from a parous woman, aged 54, on August 15, 1913. Her menopause had occurred six years previously; but for the last year haemorrhage had recurred, and at the date of operation she was losing blood during twenty-one days in every month. She had no pain. The tumour gave the physical signs of a 'fibroid' uterus. The patient was not a fat woman.

The macroscopic and microscopic appearances are seen in Figures A and B, Plate XVI.

Whilst writing these pages I had the good fortune to remove a myomatous uterus which illustrates much the same condition as that shown in the case of Maxwell and Gordon Ley.

The patient was aged 51 years. She had borne one child twenty-nine years previously. A polypus had been removed from the uterus five years previously, after which the patient was quite well until 1911. Uterine haemorrhage again set in three years ago; and it was for this that I was consulted in May, 1914. The loss was very frequent and profuse. The kidneys and ureters were examined for calculus by X-rays with a negative result. There was a mobile mass in the right iliac and lumbar region, and also a tumour diagnosed as a myoma of the left broad ligament. The operation was difficult because of an embedded myoma, which spread itself out in the left broad ligament, and was unusually adherent to the cellular tissues. The specimen was the shape of a dumb-bell or cottage loaf, *i.e.* there was a corporeal rounded growth, united by the isthmus of the uterus to another spherical growth which lay in the posterior wall of the cervix. The latter was of very soft consistence, and was densely adherent to its cellular bed in the broad ligament.

On section, after hardening in Kaiserling-Pick's solution, it showed a yellowish surface which became concave instead of convex. It was quite soft (excepting for its capsule) even after hardening for fourteen days in preservative. The cut surface had not entirely lost its whorled appearance (see Figure B, Plate XVII.). Sections were made by freezing, and stained with Sudan III. They showed large fat-globules within muscle-fibres, the latter retaining their nuclei (see Figures A and B, Plate XVII.).

As already stated, examples of fatty metamorphosis of fibrous tissue or of muscle are exceedingly rare in uterine growths. The difference between fatty metamorphosis and fatty degeneration is best appreciated by comparing Figure B with Figure C, Plate XVI.

Necrosis: Necrobiosis (Red Degeneration).—Areas of *necrosis* are not uncommon

¹ *Trans. Royal Soc. Medicine (Obstet. and Gynaecol. Sect.)*, London, vol. vii. No. 4, pp. 150-153.

in myomata; they are found in association with hyaline degeneration, the latter probably corresponding to the cloudy swelling seen in other tissues of the body as the initial stage of death of the part. Necrotic patches are liable to occur in subserous, interstitial, and submucous myomata. Necrosis is common in submucous growths, where it may pass into gangrene as the result of infection of the dead tissue by saprophytic organisms derived from the genital tract. Necrotic areas assume various colourings dependent upon the blood-vascular changes in their neighbourhood; they may be yellow, grey, grey-brown, greyish-purple, magenta-red, or mahogany-red.

Necrosis is to be found, according to Tracey, in 5 per cent of myomata removed by operation. The central parts of a myoma, being the most remote from its blood-supply, are most prone to undergo necrotic change, and from the centre the area of tissue-death spreads towards the periphery. The demarcation is often quite sharp, or it may be indefinite, being surrounded by a kind of penumbra or halo where the changes are not so intense.

The term 'necrobiosis' has long been used to describe *partial* destruction or death of the tissues, in contradistinction to 'necrosis' or total death. It has received a narrow application by gynaecologists of late years, the tendency being to employ it to designate one particular form of necrosis which has claimed the special attention of clinicians because of its frequent association with pregnancy and puerperal state. It is also often spoken of as 'red degeneration.'

With regard to the suitability of the term 'necrobiosis' as descriptive of red degeneration of myomata, it may be said that there is clinical evidence to suggest that many of these tumours do recover their lost vitality, and hence their degeneration can only have been partial. On the other hand, there is ample clinical and pathological proof that they frequently undergo liquefaction and total necrosis, *i.e.* that they behave in the same way as necrotic myomata in general. It seems illogical therefore to regard the term 'necrobiosis' as synonymous with 'red degeneration'; necrobiosis is only a passing phase in a degenerative process, leading on to actual death in the case of some myomata, and stopping short of it in others, the question of the colour of the tumour being a side-issue.

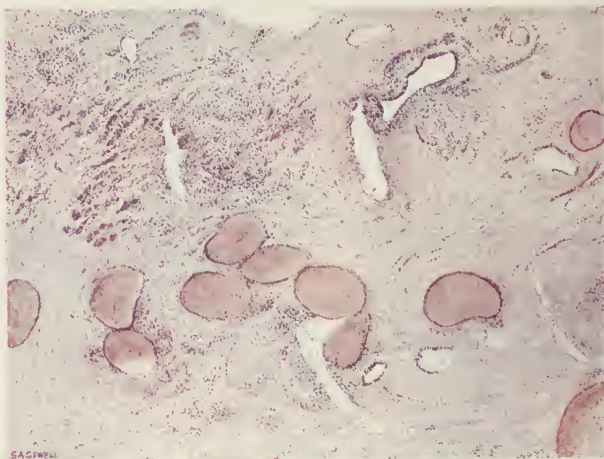
Microscopically, the stage at which degeneration has arrived is estimated by the number and appearance of the cell-nuclei, and by the behaviour of the cytoplasm when submitted to certain stains; when such a test is applied to red myomata, it cannot be said that they show any distinctive difference as compared with other necrotic forms, so that in a series of slides illustrating necrosis, it is impossible to pick out an example of red degeneration, say, from a white, or a yellow. The microscopic features enumerated under "Fatty Degeneration" (p. 224) will hold good, irrespective

A



Shows total red necrosis of a myoma in a nulliparous uterus. Removed from a spinster aged 36 years.

B



Showing red necrosis and thrombosed blood-vessels.
2 in. obj. 2 eyepiece.

of the colour which the tissue happens to possess. Histologically, therefore, red myomata have no special characteristics by which they can be distinguished; in other words, they do not represent a definite *pathological type*. This statement need not detract from the importance which this 'red degeneration' has assumed from the clinical standpoint. Its frequent association with pregnancy is well known, and will be further referred to ("Pregnancy with Myomata," p. 249). It is not confined to myomata in the gravid uterus, but apart from pregnancy it is relatively uncommon. Figure A, Plate XVIII. shows a myoma in a state of total red necrosis, removed from a nulliparous spinster, aged 36 years.

Myomata in a state of red degeneration are of comparatively soft consistence. On cut section they resemble raw or partly cooked beef-steak; they give off a peculiar fishy odour; dilated and thrombosed vessels may sometimes be seen in the capsules surrounding the growths, and more occasionally in their interior (see Figure B, Plate XVIII.). The colour of these tumours is due to the tissues being stained by soluble blood-pigments.¹ Leith Murray attributes the diffusion of blood-pigments to the laking of the corpuscles produced by lipid substances (see "Fatty Degeneration"). The nature of the pigment is still unknown.

The exact importance of thrombosis in red degeneration, and the stage at which it occurs in the sequence of changes, is uncertain. After a careful study of Leith Murray's work and a survey of all the facts, one is led to the conclusion that *haemolysis* and not *thrombosis* is the predominant change, and the term "Necrosis with Haemolysis" which he suggests by way of nomenclature seems particularly apt and suitable.

A question of interest in relation to the presence of fat in necrotic myomata is whether the red variety differs from the other types of necrosis in the *amount* of fat which is present?

If we attempt to summarize the colour-question of necrotic myomata according to the light thrown upon it by Leith Murray, we find that the tint assumed by the necrotic tissue varies with the amount of lipid substance present. We thus have:

Red degeneration	= Lipoid just sufficient to produce perfect haemolysis.
Brown, or brownish- black, grey, etc.	} = Lipoid in moderate excess.
Yellow necrosis	
	= Lipoid in excess sufficient to bleach.
White necrosis	{ = } Lipoid insufficient to produce haemolysis, the latter being restrained by blood-plasma.

¹ H. Leith Murray, *Journ. Obst. and Gyn. of Brit. Emp.*, 1910, vol. xvii.

Why is the staining of the tissues, due to the haemolytic property of lipid, more frequently demonstrated during pregnancy than at other times? No one who has examined a large series of myomata over a long series of years will dispute this fact. Despite the similarity in the microscopic characters of the differently coloured necroses, it is most excusable and natural for clinicians to associate 'red degeneration' almost exclusively with pregnancy. Not only is this change more common in the gravid state, but it is also generally complete. If pregnancy has proceeded far enough, the entire tumour is wont to be uniformly stained with blood-pigment, whereas in the absence of gestation, or in the first half of pregnancy, the change is, *as a rule*, only partial. (Figure A, Plate XVIII., however, shows an exception to this statement.)

Leith Murray tells us that blood-plasma has a restraining influence on the haemolytic action of the lipid substances; but may we not go further, and on combined clinical and pathological grounds, infer that pregnancy exerts a control on the "restraining influence" of the blood-plasma in relation to haemolysis?

When red myomata become infected, they are capable of producing acute toxic symptoms, but fortunately as a rule they are sterile.

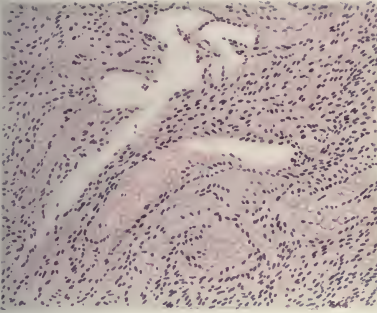
Independently of infection, these red myomata may undergo cyst-formation from liquefaction, in a way similar to that described under "Hyaline Degeneration." The cyst-contents in these cases are usually chocolate-coloured from the presence of blood-pigments. Such 'blood-cysts' are not found during pregnancy.

Circulatory Changes in Myomata.—Oedema.—The term 'oedematous myoma' has been far too extensively used; if a myoma is soft and exudes fluid on section, some clinicians at once write it down as an oedematous myoma, but more often than not, the change is one of liquefaction following on hyaline degeneration (the so-called mucoid or myxomatous change). True oedema is not at all common; at any rate, it is less usually seen than liquefaction following hyaline degeneration, but of course it may occur in a hyaline myoma.

The oedematous uterus, when removed, feels semi-fluctuant, suggesting the gravid organ. On section much serum escapes, and on removing a cut tumour from Kaiserling's solution, its surface is seen to have become concave, and furrows may appear between the cut lobes. The fluid which exudes on section is typical oedema-fluid; it contains but little albumen, thus contrasting it with the highly albuminous fluid which results from liquefaction of hyalin.

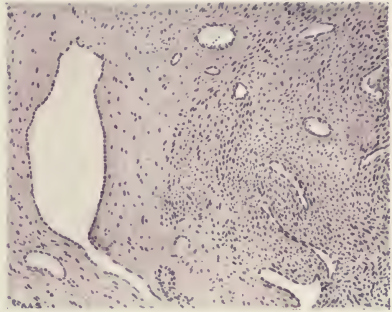
Microscopically (see Figure A, Plate XIX.), this serum is seen as a flocculent or granular material, separating the muscle-bundles asunder, and under a higher power it can be seen that the muscle-fibres are swollen, from intracellular transuda-

A



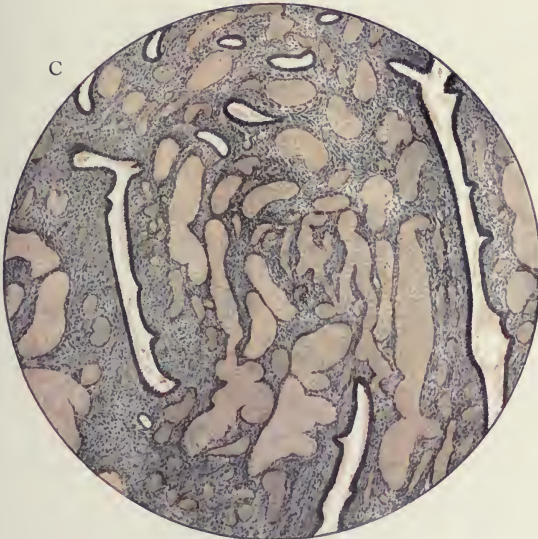
Showing a soft ædematous myoma, with the muscle-bundles separated by a flocculent deposit which has been fixed by Kaiserling's fluid.
(Edematous infiltration is associated with dilatation of lymph-channels).

B



Showing that dilated lymphatics are not necessarily associated with ædema.
3 in. obj. 2 eyepiece.

C



Showing an adeniferous myomatous polypus with engorged blood-vessels due to stasis. This condition is spoken of as 'telangiectasis,' but there is no new formation of vessels. (From Eden and Lockyer's Gynaecology).

tion. These swollen muscle-fibres are particularly striking in transverse section ; some are without nuclei, perhaps as the result of maceration.

In oedematous myomata the lymphatic channels are dilated, and hyaline change is generally to be found, the latter being in no sense due to the oedema, but merely a coincidence. It is the myoma impacted in the pelvis which becomes oedematous, the oedema being due to compression sufficient to produce slight circulatory disturbance. Closely connected, as we have stated, with oedema is a dilated state of the lymphatics or lymphangiectasis. The dilatation of the lymph-channels is probably, if not always, the result of some mechanical compression undergone by the tumour. It may be that oedema is a secondary condition, consequent on the transudation of lymph from the engorged lymphatics. At any rate, dilated lymphatics can be found unaccompanied by oedema (see Figure B, Plate XIX.), but I have not found the latter in the absence of dilated lymph-channels.

Dilatation of the lymph-spaces is sometimes an accompaniment of telangiectasis of the blood-vessels (*vide infra*).

Axial Rotation.—A freely mobile pedunculated myoma lying in the abdominal cavity may undergo rotation of its pedicle (Fig. 90, p. 197, and Fig. 106, p. 222), and if the tumour is large and the twist extreme it may also influence the body of the uterus, causing it to rotate upon the cervix. The rotation of the stalk of a myoma is usually only partial, owing to its thickness. If the twist is only partial, and has been gradually produced, the tumours may not show any gross change. Figure 90 is an example of this. The naked-eye appearance of the two growths, each of which has a twisted pedicle, is normal as regards colour, and shows the typical whorled appearance of a hard myoma. I have met with two cases in my operative practice where definite stasis was manifest, the tumours in each case being adherent and of a dark plum-colour. If the subserous tumours have undergone hyaline and cystic change before torsion, the cysts become filled with chocolate-brown or greenish-brown fluid. Microscopically, telangiectatic areas are to be found together with interstitial haemorrhage, hyaline areas, and liquefaction.

Torsion of a myoma is far less likely to produce acute symptoms than is torsion of an ovarian cyst, but these twisted growths may cause pain and rise of temperature, due to the contraction of adhesions. They also may become infected, break down, and suppurate. As already stated under "Calcification" (p. 223), these growths may become separated from the uterus and lie free in the peritoneal cavity.

In Figures 105 and 106, pp. 221 and 222, can be seen some omental veins at the top of the tumours, showing that the growth was getting a supply of blood from omental vessels. To such myomata Kelly and Cullen give the name 'parasitic.'

Telangiectasis.—This change in myomata is placed under the heading of Degenerations, mainly for the sake of convenience. True angiomyomata are extremely rare, and space does not permit of giving this type of growth a separate heading. Moreover, in my own experience telangiectasis has only been very partial in its distribution, occurring in limited areas in myomata undergoing necrosis, hyaline degeneration, or cystic change, and in peritheliomata. Considered as a concomitant of degeneration, the best example afforded of this condition of dilated vessels is to be found in tumours which have suffered from mechanical obstruction of their blood-supply. Notably is this the case with myomatous polypi, the lower poles of which are often in a state of telangiectasis. The same applies to some subserous myomata with twisted pedicles.

I have also found this change in myomata, portions of which have become sarcomatous, but apart from sarcoma and perithelioma, this excessive vascularity has always been associated with some interference with the blood-supply of the tumour, and has been associated with necrosis, red degeneration, or hyaline and cystic degeneration.

In this connection *telangiectatic* areas are quite a common condition. Cullen has had the good fortune to examine a tumour which he justly claims to be an angiomyoma, and in his description and figuring of this growth, it is interesting to note that it presented areas of cyst-formation and that, microscopically, the myomatous tissue was in a state of hyaline degeneration.

That we should occasionally find such rich naevoid structure in close connection with tissues which are apparently starving for want of proper blood-supply, is curious. It is possible that in areas which are frequently regarded as telangiectatic, no new vessels have been formed, but that the capillaries of the part have been brought into evidence by engorgement and thrombosis due to stasis (Figure c, Plate XIX.). I have found exactly the same *telangiectatic* condition in the most dependent parts of the cervix and vaginal wall in the case of an old procidentia uteri, as are to be seen in telangiectatic myomatous polypi, *i.e.* dilated capillaries and fully-formed vessels filled with blood.

Telangiectatic areas stand out prominently when tumours are hardened in Kaiserling's solution. Figure 107 is an example. It shows a uterus which contains multiple interstitial myomata. Two nodules in the fundus (split open to show as four) show dark areas of telangiectatic change.

Infection of Myomata.—Myomata are liable to infection from three sources. The usual channel by which infection gains access is the vagina and uterine cavity; therefore this complication is most commonly met with in submucous growths.

A second source is also the result of an ascending infection which has now reached the abdominal ostium of the tubes, and the myoma thus becomes infected from below and from above. The third source is the bowel, through the adherent peritoneal coat. Myomata may also be infected through the blood, and Cullen mentions the case of an interstitial myoma, globular in shape and 7 cm. in diameter, which was



FIG. 107.—Showing telangiectatic areas in myomata. The colour has been fixed by Kaiserling-Pick's method of preservation.

very soft and putty-like on section, smear-preparations from which showed tubercle bacilli. The parts of a myoma lying in the pelvis are far more liable to infection than those higher up, owing to the frequency with which tubo-ovarian inflammation is associated with myomata.

Suppuration.—Abscess-formation in myomata is very rare ; it has been found in interstitial, subserous, and intraligamentary growths. In the case of interstitial growths the infection is from the endometrium ; in subserous growths from the bowel, large or small ; and in the intraligamentary growths probably from the rectum, or secondary to ovarian abscess and pus-tubes. My personal experience of suppuration

in myomata is confined to three cases. In Figure 108 is seen an intraligamentary myoma, large portions of which are sarcomatous, others calcareous, whilst, between the sarcoma-tissue and the calcareous myoma-tissue is a cavity which was filled with pus.

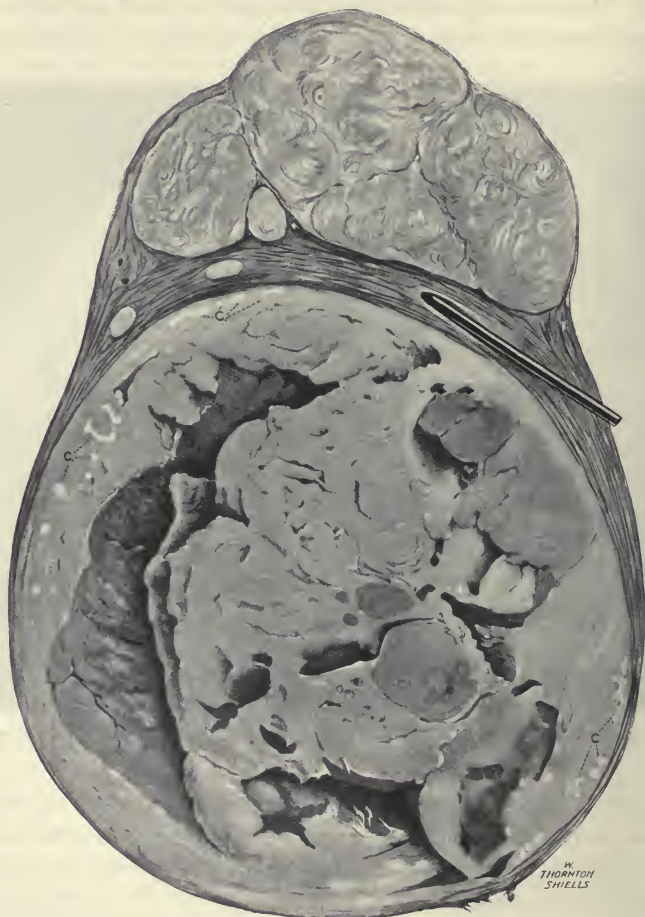


FIG. 108.—Showing an intramural myoma, the greater part of which has undergone sarcomatous change. There was a large crescentic abscess-cavity between the sarcomatous central part and the peripheral, calcareous myomatous tissue.

Sloughing and Gangrene.—This condition is practically confined to submucous and polypoid growths, the cause of the infection, which is always saprophytic,

being the exposure of the growth in the genital canal to organisms introduced from without, sometimes by the passage of a sound, or by the introduction of pessaries and specula into the vagina. Injury to the capsule of the tumour by the point of a sound is a common cause of sloughing. The protecting capsule may be abraded or torn during the process of natural extrusion, and gangrene may result. The condition is quite common; it is found in tumours of all sizes, and will be referred to under the clinical description of submucous growths.

Adhesions.—Tracey in a series of 3561 cases of myomata found that the growth was adherent in 3·5 per cent, so that this complication is not so frequent in the case of myomata of the uterus as in ovarian cysts. Pedunculated subserous growths are the most likely to become adherent, because of their degenerative condition, their liability to stasis, and their need for additional nutrition. An inflamed *appendix vermiformis* is an occasional, and salpingo-oöphoritis a common cause of myomata becoming involved in adhesions.

Malignant Changes in Myomata.—Myomata being exclusively mesenchymal growths, the only type of malignant metaplasia which they can possibly undergo must likewise be mesoblastic.

We may thus have (1) malignant leiomyomata which are very cellular, and capable of producing metastases, although they are not *histologically* malignant; (2) sarcomata formed by malignant metaplasia from the muscle-cells and from the connective-tissue cells of a myoma; (3) peri- and endothelioma, which are types of sarcomata of low malignancy, arising from the blood-vessels and lymphatics of a myoma. Epiblastic tissue being absent, it is impossible for epithelioma and carcinoma to develop from within a myomatous tumour. A myoma may, however, be *invaded* by a carcinoma and also by a co-existing sarcoma. See "The Uterine Mucosa in Cases of Myomata," p. 239.

Malignant Leiomyoma.—In common with other observers I have examined the metastatic deposits from the lungs and pelvic cellular tissues of a case in which there was a large myoma of the uterus, and where all the growths, primary and secondary, had the structure of an innocent-looking myoma.

Sarcoma.—The possibility of a sarcomatous change occurring in a myoma has received a very tardy acceptance at the hands of London gynaecologists, and even up to the present some observers, including Bland-Sutton, are still sceptical. It seems to me that just as a chemist, from his knowledge of molecular weights, is certain of the existence of a missing element long before it is discovered, so the pathologist who commences to investigate uterine tumours starts with the full expectancy of finding a sarcoma developing in a myoma. The natural history

of a myoma, the type-cell of which is the embryonic fibroblast, would be incomplete without this faculty of developing malignant metaplasia.

If a muscle-cell when it is a normal constituent of the uterine wall can undergo malignant metaplasia, why should not a muscle-cell when it happens to be a component part of a myoma do likewise?

Figure 108, p. 232, shows a breaking-down myoma which was situated between the folds of the broad ligament and which showed calcareous changes, an abscess-cavity, and areas of sarcomatous transformation.

Endotheliomatous Transformation in Myoma.—This change has already been referred to under "Telangiectasis." The tumour is shown in Figure 106, p. 222, and the areas which I regard as showing endotheliomatous change are drawn in Figure A, Plate XX.

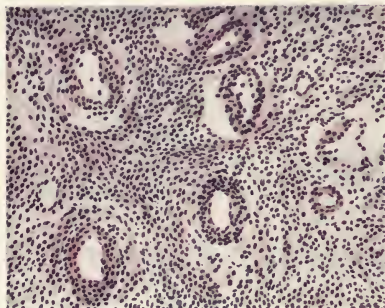
The naked-eye appearances of this particular growth are those of a 'fibrocystic' uterine tumour, the pedicle of which has been twisted. Its summit shows omental adhesions from which the fat has become absorbed, leaving only the blood-vessels which, no doubt, are supplying the tumour-mass with nutrition. The telangiectatic and endotheliomatous areas are seen to lie above the smaller of the two cysts.

Frequency of Sarcomatous Changes.—Fehling (quoted by Cullen) found that in 409 myomata, eight specimens showed sarcomatous transformation. Martin in 205 cases observed direct sarcomatous metaplasia in four instances. In Kelly and Cullen's series of 1428 cases, this change was found 17 times and 17 other cases were suspects. Cullen does not think this percentage of 1.21 represents the proper proportion, as only such cases were examined as presented suspicious areas to the naked eye. Cullen's percentage is very similar to that of other observers, *e.g.* Noble found it worked out at 1.8 per cent, and Tracey gives 1.5 per cent.

Direct microscopical evidence of sarcomatous change is, now and then, supported by clinical data. The subjects of apparently innocent myomata, after the removal of these tumours, have succumbed to recurrence. Polypi which have been found innocent have recurred again and again, and have ultimately been found to have undergone sarcomatous transformation.

Naked-eye Appearance of Sarcomatous Areas.—It must be accepted that early sarcomatous change cannot be recognized macroscopically, but when the condition is well established the gross features of the malignant area afford a striking contrast to the surrounding unchanged myomatous tissue. Quite frequently the malignant area is sharply defined, the line of demarcation is very definite, the cut surface is uniformly homogeneous and of a yellowish-white or buff colour, and the malignant

A

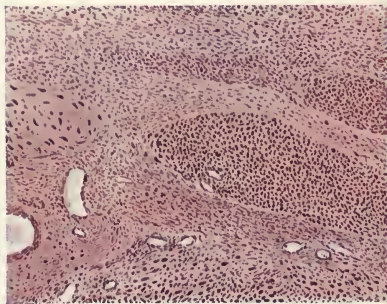


Showing an endotheliomatous area in a
cystic subserous myoma

$\frac{1}{4}$ in. obj. 3 eyepiece

B

Hyaline
area with
metaplasia
of muscle-
cells



Metaplasia

Sarcomatous area in a myoma. The malignant
change is taking place in the muscle-cells and not in
the fibrous tissue. $\frac{3}{8}$ in. obj. 3 eyepiece.

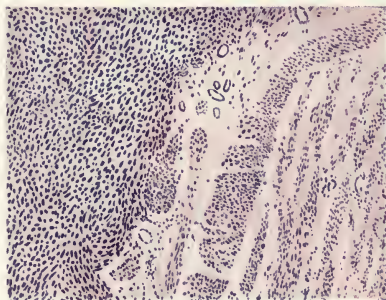
C



Sarcomatous metaplasia of muscle-cells

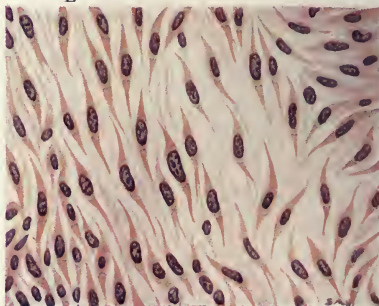
Same section as Figure B under a higher power,
showing variety of size and shape of nuclei.

D



Showing sarcomatous metaplasia of the muscle-cells
of a myoma. $\frac{3}{8}$ in. obj. 3 eyepiece.

E



Same section as Figure C under a higher power, showing
transformation of muscle-rods into spindles.

area is softer than the surrounding tissue. In some examples the new growth is not definitely outlined, but merges into the surrounding tissue.

Like sarcoma elsewhere, the malignant areas may become cystic from dilatation of lymph-spaces; haemorrhages may occur in the tissues, staining them a reddish-



FIG. 109.—Showing a myomatous uterus invaded by a round-celled sarcoma. The latter is submucous in situation, and probably arose from the connective-tissue stroma of the endometrium.

brown; and blood-cysts may form from the breaking down of the embryonic blood-vessels. Sarcomatous changes usually commence in the central part of a myoma.

Microscopic Appearances of Sarcomatous Transformation.—Cullen shows that there are two varieties:

- (1) Sarcomatous metaplasia of the connective-tissue cells.
- (2) Sarcomatous metaplasia of the muscle-cells (Figures B, C, D, and E, Plate XX.).

In most cases the sarcoma-cells are thought to be due to metaplasia of the connective-tissue cells of a myoma, but in 13 of Kelly and Cullen's cases they were apparently the result of a transformation of the myomatous muscle-fibres, and in the remaining cases the presumptive evidence was in favour of a similar origin. The test was always made by taking sections from the periphery of the growths, because in the central portion all trace of the myomatous tissue has disappeared, and its place is occupied by spindle-celled sarcoma.

The sarcomata of connective-tissue origin are either spindle-celled or round-celled; those of muscular origin are invariably spindle-celled. It is possible that both stroma and muscle may take part in the malignant transformation simultaneously.

As stated under "Hyaline Degeneration," this condition is often a precursor of, or, at any rate, intimately associated with, sarcomatous transformation (see Figures A and B, Plate XXI.).

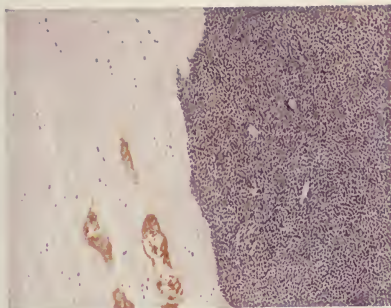
We have stated on p. 233 that a myoma may be invaded by a sarcoma; Figure 109 shows the anterior view of a myomatous uterus showing two submucous nodules which on section proved to be large round-celled sarcomata. These nodules were covered by a large blood-clot, which filled the uterine cavity at the time of operation. A coronal section through the meridian of a large myoma in the posterior uterine wall of this specimen also showed several rounded areas of yellowish, opaque, homogeneous sarcoma. These areas contrasted sharply with the whorled appearance of the myomatous tissue. There was a metastasis in the broad ligament on the right side. The microscopic appearances are seen in Figure c, Plate XXI. The round sarcoma-cells are packed in large alveoli which have formed in the myomatous tissue. The latter appears to have undergone no responsive change.

CHANGES IN THE UTERUS PRODUCED BY MYOMATA

Position of the Uterus.—This is mostly influenced by retroperitoneal myomata. The burrowing intraligamentary growths will cause lateral displacement, which varies in degree according to the size of the myoma. Interstitial cervical growths elevate the body and elongate the cervix.

Backward displacement and flexion of the body are often produced by interstitial growths, and sometimes by sessile and pedunculated growths arising from the posterior wall. The body of the uterus may be pushed backwards, forwards, or more rarely downwards, by interstitial myomata, whilst submucous growths may drag it down and even invert the fundus.

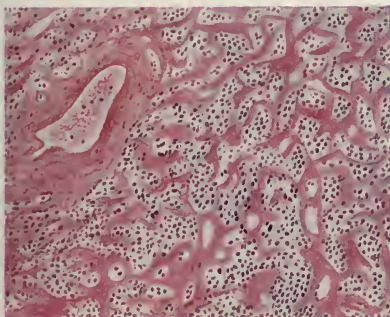
A



Showing a sarcomatous area ending abruptly in the hyaline tissue of a myoma. The insert is a drawing of the naked-eye appearance of the microscopic section.

$\frac{3}{8}$ in. obj. 2 eyepiece.

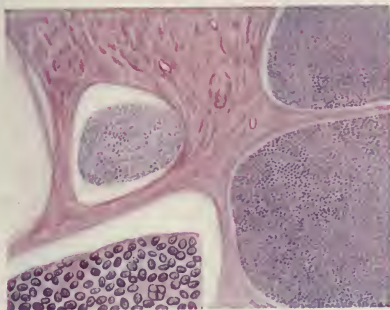
B



Showing trabecular arrangement of hyaline tissue which has left spaces in which the muscle-cells can swell up and undergo sarcomatous metaplasia.

$\frac{3}{8}$ in. obj. 2 eyepiece

C



Showing invasion of a myoma by a co-existing sarcoma. In the right-hand lower alveolus the cells are shown under $\frac{1}{8}$ obj. No. 3 eyepiece.

Size of the Uterus.—The uterus is generally enlarged in the case of myomata; this is due to an associated hyperplasia of all its component parts; whether this be the effect of the myoma, or whether the hyperplasia and the myoma are due to a common factor (? ovarian), is a debatable point.

Subserous growths, whether single or multiple, alter the size of the uterus but little. In the case of interstitial growths, it is usual to find a great increase in thickness of the muscular walls, so that often after myomectomy the uterus, when sewn up, is of twice the normal size. The walls of a uterus which is engaged in extruding a submucous myoma are thickened; see Figure 94, p. 202, which shows a uterus opened up during the partial 'delivery' of one of these growths. The behaviour of the uterine muscle in this case calls to mind the polarity of the uterus, seen in frozen sections of the organ, during the second stage of labour. In these cases it seems fair to assume that the increased thickness of the uterine muscle is due to physiological hypertrophy.

Shape of the Uterus.—This is altered in so many ways as to defy description. With a submucous myoma it often assumes a uniform pear-shape and resembles the pregnant organ in consistence and contour.

The Cervix.—When the myoma is corporeal the cervix does not, as a rule, share in the general hyperplasia. In cervical interstitial growths the muscular capsule is stretched out and thin, the canal is lengthened (see Fig. 96, p. 204), and its axis deflected, so that the os may be found to one or other side, or pushed up underneath the symphysis pubis.

The Cavity of the Uterus.—The cavum uteri is mostly influenced by submucous sessile and pedunculated growths. In the case of the sessile submucous growths, the enlargement is often apparently more than the presence of the growth would account for; see Figure 92, p. 200, which shows the cavity enormously enlarged over the submucous segment of a "cup and ball" myoma; also Figure 101, p. 216, where the cavity is widened and elongated over the submucous portion of a myoma undergoing liquefaction. Figure B, Plate XI. shows the same enlargement of the cavity, due to the presence of a submucous growth. Figure 93, p. 201, demonstrates the dilatation of both the cavum and cervical canal by a submucous growth.

It is obvious that the size and shape of the cavity will vary with the propinquity of the growth or growths, and with the extent to which they encroach on its lumen. A subserous fundal growth will leave the cavity beneath it unaffected. A wide interstitial growth with a submucous segment will stretch the cavity in length and width to an enormous extent, as shown above; if, on the other hand, it does not push its way towards the cavity, the latter will not be affected.

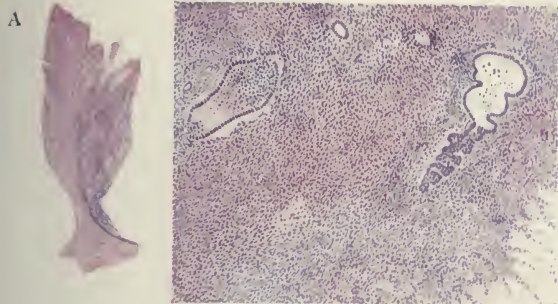
The Uterine Mucosa in Myomata.—Like the muscularis, the mucosa of the body of the uterus is influenced by the hyperaemia which prevails in cases of myomata, and it is common to find hyperplasia and hypertrophy of the lining membrane in conjunction with that of the muscle-wall. The myoma may, or may not, be the exciting cause, for, as was previously stated, the uterine hyperplasia and the myomatous change may both be the outcome of ovarian hyper-secretion.

Diffuse fungous endometritis, endometritis polyposa cystica, and mucous polypi, one or the other, are frequently met with in association with myoma uteri, and I have often been able to find plasma-cells in endometria of this type; this favours the conclusion that the changes are inflammatory, and therefore not in any way caused by the growth. My experience has been to find the grossest changes in the endometrium in cases where there is also salpingo-oöphoritis present, and this again points to an infective origin for the endometritis.

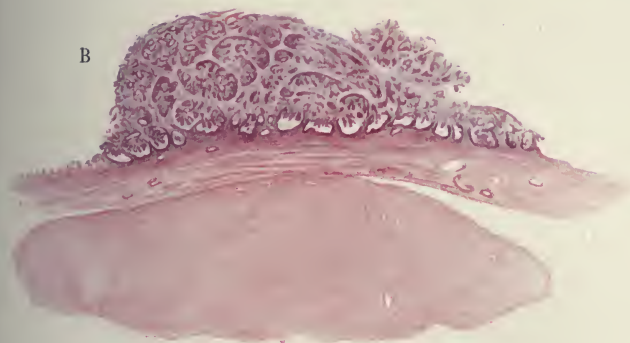
Haemorrhage in the Mucosa.—This always occurs during menstruation, but the proximity of a myoma would seem to accentuate it. Sub-epithelial haematomata are common, as are distended and engorged capillaries. Extensive disintegration of the stroma is produced by the pressure of the effused blood. These endometrial changes are not peculiar to myomata; they are seen in the endometrium in true chronic infective endometritis quite apart from new growths.

Uterine Polypi.—Mucous polypi are frequently found in cases of myomata, but again there is no traceable relationship between the two conditions; these structures are a localized overgrowth of all the component parts of the endometrium, due in my opinion to chronic inflammation. There is another type of polypus, which is sometimes found when myomata exist in the uterus. An example of this is seen in Figure A, Plate XXII. This kind of polypus is usually described as 'fibro-adenomatous,' and may be regarded as a fibromyoma with gland-inclusions. The growth is often single, but there may be many such present. Unlike the mucous polypus, it is undoubtedly a neoplasm. Its stroma consists of connective tissue and muscle, and in this are seen gland-spaces. The latter are tubules resembling those of the endometrium, but they are not surrounded by endometrial stroma, which differentiates them from the gland-structures seen in diffused adenomyomata. Except for this distinction it would be convenient to class these growths with adenomyomata, of which they would constitute a polypoid form.

Tuberculous infection of the endometrium was found in 7 out of 1428 cases by Kelly and Cullen, but in none of these were the myomata infected. In some



Showing the naked-eye appearance and microscopic characters of an adeniferous myomatous polypus.



Showing adeno-carcinoma of the corporeal endometrium overlying a portion of a myoma which had undergone hyaline degeneration. $\times 8$



Showing the muscle-tissue of a myoma being invaded by adeno-carcinoma of the corporeal endometrium.

- M. Myomatous tissue
- C. Invading adeno-carcinoma
- C.¹ Epithelial proliferation and metaplasia

of the cases, the implication was quite recent ; in others, the endometrium was completely replaced by granulations ; and in one, the cavity was filled with creamy fluid.



FIG. 110.—Showing carcinoma of the cervix and myoma of the body of the uterus.

Malignant Changes in the Uterine Mucosa.—Cullen, in over 1400 cases of uterine myomata, found cancer of the body in 25 (1·7 per cent).

In 1118 cases, Noble found cancer of the body in 2·4 per cent. Tracey, in 3561 collected cases, found corporeal cancer in 1·7 per cent. Piquand (1905), quoted by Bland-Sutton, found cancer of the body associated with myomata in 15 out of 1000 cases ; and Bland-Sutton's own percentage is 1·6 ; in every case the patient being over 50 years of age.

In 210 major operations for myomata, I have found carcinoma of the body in two cases, and carcinoma of the cervix also in two cases. In removing uteri for carcinoma, it is not uncommon to find one or more small myomata, but I have not taken note of this fact in the above statement.

Three of the above cases are figured in the text; the fourth specimen has been lost.

The *coincidence* of cancer and myoma in the uterus is of great clinical importance, but pathologically it cannot be said that one growth predisposes to the development of the other, although operation-statistics alone seem to favour this view. If the myoma is submucous, an adeno-carcinoma of either cervix or body will favour the infection of the former by pathogenic germs. The mucous membrane of the cervix or body of the uterus may be the seat of a carcinoma, and the malignant growth may lie in close proximity to a myoma without involvement of the latter. I have shelled out a myoma from a bed of cancerous tissue and failed on microscopic examination to find any penetration of the growth by cancer cells. The spreading cancer-cells took the line of least resistance, and ran along the lymph-channels, in the cleavage between the growth and the uterine muscle, avoiding the more compact and comparatively avascular myoma.

In Figure B, Plate XXII. is shown a section of a myoma in a state of hyaline degeneration, together with adeno-carcinoma of the corporeal endometrium. Not only the myoma, but also its muscular capsule, has escaped invasion.

Plate XXIII. shows a corporeal carcinoma in a uterus which was removed as myomatous from a woman aged 54 years. The growth invaded the adjacent myomatous nodules. Figure c, Plate XXII. shows a section through the submucous portion of one of the myomatous tumours. The processes of an adeno-carcinoma are eating their way into the fibro-muscular tissue of the myoma; some of the cancer-cells have undergone metaplasia and are becoming keratoid. Figure 110 shows the co-existence of a corporeal myoma and carcinoma of the cervix. The patient was aged 50; she had been treated for many years for uterine haemorrhage. The clinical history suggested that the myoma had existed for many years.

CONDITION OF TUBES AND OVARIES IN ASSOCIATION WITH MYOMATA OF THE UTERUS

Fallopian Tubes.—Out of 934 cases Cullen found that one or both tubes were *adherent* in 434. This large percentage was made up as follows: white subjects 35.6 per cent, coloured subjects 63 per cent, showing the interesting fact that adherent appendages were almost twice as frequent in negroes as in white women.



Showing a uterus which is the seat of multiple myomata and cancer of the endometrium. The latter invaded adjacent myomata. See Figure C, Plate XXII.

Hydrosalpinx was noted 88 times in Kelly and Cullen's 934 cases. A well-marked example from one of my own cases is seen in Figure 111.

Haematosalpinx.—Kelly and Cullen record 12 cases of pure hydrosalpinx and 100 cases of haemorrhagic hydrosalpinx in the 934 cases mentioned above.

Chronic Salpingitis (non-purulent).—This condition in Kelly and Cullen's series was found to exist in 48 cases, *i.e.* in about 5 per cent, and in all but 3 cases it was bilateral.

Pyosalpinx.—Kelly and Cullen found pyosalpinx in 41 cases, *i.e.* in 4.4 per cent.



FIG. 111.—Showing a myomatous uterus and a right-sided hydrosalpinx. Attached to the posterior surface of the uterus below the level of the fundus is the pedicle of an old ventri-suspension or fixation.

From Kelly and Cullen's statistics it would appear that gross inflammatory changes are found in over 9 per cent of cases operated upon for myoma uteri, and that in nearly half of these the salpingitis has reached the stage of suppuration.

Tubo-ovarian Cysts.—These interesting and puzzling structures are found to accompany myomata of the uterus, and when it is remembered how frequently salpingo-oöphoritis is associated with 'fibroids' of the womb, this is not to be wondered at.

Tubercle.—In 14 out of 934 cases Cullen found the Fallopian tubes to be the seat of tuberculosis; in every case the disease was bilateral, and in six instances the character of the lesion was recognized only on microscopic examination. In one case only was tuberculosis suspected before operation, the symptoms of myoma overshadowing

the infective process. This case was under the care of Halsted for hip-joint disease. The endometrium in some of these fourteen cases was likewise affected.

Tubal Pregnancy.—I have once met with this condition as a complication of myoma uteri; this case is shown in Figure 119, p. 260, where the case is referred to under "Pregnancy and Myoma." The operation was performed for extra-uterine pregnancy; the myoma was discovered at the operation. Kelly and Cullen encountered six tubal pregnancies in 934 cases of myoma uteri.

Ovaries.—The ovaries were adherent, or showed some pathological change,



FIG. 112.—Showing a myomatous uterus and a typical tubo-ovarian cyst.

in nearly one half of the cases examined by Cullen, *i.e.* in 438 out of 934. The lesions included 184 cysts of various sizes. Nine were multilocular cyst-adenomata, twelve were cystic papillomata, and seventeen were dermoid cysts. Among the classified cysts were also 68 Graafian-follicle cysts which varied in diameter from 1 to 8 inches.

Lutein cysts were present in thirty-four cases; these varied in size from 1 to 4 inches. The presence of so large a number of follicular and lutein cysts is accounted for by the corresponding frequency of adhesions, since both these varieties of cysts are the results of atresia caused by inflammation.

Lutein haematomata are not infrequently met with in the cases of adherent appendages found associated with myomata. They are often densely adherent,

and they are easily infected. Figure 113 shows bilateral lutein haematomata together with a myomatous uterus.

Multilocular Cystadenomata.—In a series of nine cases mentioned by Kelly and Cullen, the myoma predominated clinically in five, and in the remaining four the symptoms caused by the cyst were of primary importance; in one case the pedicle of the cyst was twisted.

Papilliferous Cysts.—Cullen mentions ten cases in which this was unilateral and two in which it was bilateral. In four instances the papilliferous growths had



FIG. 113.—Showing bilateral lutein haematomata with a large myomatous uterus. This tumour was removed in London by Howard Kelly with my assistance. Both cysts ruptured, and thick inspissated blood escaped during operation.

penetrated the cyst-wall and extended to the peritoneum. Ascites is only mentioned as occurring in one of these cases.

Parovarian cysts are also met with in association with myomata.

Adeno-carcinoma of the Ovary.—Cullen found malignant disease of the ovaries in 8 out of 934 cases. In four of these the disease was bilateral; in some there was secondary involvement of other structures.

Dermoid Cysts.—In seventeen cases of the Kelly-Cullen series ovarian dermoids were present; they were usually unilateral, and varied in size from 3 cm. to 17 cm. in diameter. In two-thirds of the cases dense adhesions existed. There were two deaths in this series: one from infection and one from myocarditis.

Fibroma of the Ovary.—Three cases of unilateral fibroma of the ovary are mentioned by the above authors, and as they state, this “association” is of interest only to the pathologist, having no clinical importance (see Fig. 105, p. 221).

Ovarian Abscess.—This serious complication is generally secondary to infection of the Fallopian tube and pyosalpinx. The condition is due in the majority of cases to infection of a lutein haematoma or follicular cyst. It is one of the most dangerous complications of uterine myomata.

POSITION OF THE BLADDER AND URETERS

The Bladder.—Cervical and retroperitoneal myomata arising anteriorly will cause elevation of the bladder, and the same effect is produced by myomata arising elsewhere when they happen to become impacted. A large interstitial or submucous growth in the fundus, may cause retroflexion of the uterus and become impacted; it will then draw up the urethra and base of the bladder, thus giving rise to symptoms simulating an incarcerated retroverted gravid uterus.

Slowly growing myomata will, during their ascent into the abdomen, cause a gradual elevation of the bladder; with marked ascent, it is not unusual to find the bladder high up in the abdomen. Adhesions between the serous coat of the bladder and a myoma more rarely account for upward vesical displacement. Downward displacement is more uncommon; but I have met with a few cases in which cystocele was an accompaniment of large myomata, and in one instance this occurred in the case of an elderly nullipara,¹ so that the effects of labour could be excluded.

The mucous membrane of the displaced bladder is usually normal, cystitis is uncommon, and if the viscus is cut into, or torn open, during operation no harm, as a rule, results, if the wound is properly sutured. The walls of an elevated bladder are sometimes extremely thin, and may be mistaken for peritoneum. Bland-Sutton removed the upper third of the bladder on one occasion. The wound was closed, and the bladder drained with a self-retaining catheter for ten days. Three years later it was found that the bladder could hold 15 ounces of urine. The significance of a wounded bladder is far otherwise if the accident remains undiscovered at the time of operation, since it may then lead to a fatal result from extravasation of urine.

Figure 114 shows a drawing made from a specimen in my collection. It represents both ureters and a portion of the bladder-wall. The right duct has been tied and the

¹ “Genital Prolapse,” *Practitioner*, December 1918.

adjacent vesical wall perforated. The accident happened during the removal of the large complicated tumour seen in Figure 109, p. 235, by 'blind ligation' of the right uterine artery. A blunt pedicle-needle carrying stout silk was passed deep into the pelvis between the impacted tumour and the bony pelvic wall. No doubt the ureter was felt, and taken by the operator for the uterine artery; then, probably wishing to tie the vessel as far out as possible, the blunt point of the instrument was carried forwards and pushed through the corner of the bladder. Extravasation of urine followed, leading to general sloughing of the pelvic cellular tissues. At the autopsy the septic track was found to have spread up to the umbilicus, along the cellular space in which the urachus is situated.

Silk sutures used for tying vessels in the neighbourhood of the base of the bladder sometimes work their way through its muscular and mucous coats—this has twice happened in my earlier cases; in each a vesico-vaginal fistula formed, but in both instances spontaneous closure followed.

The Ureters.—Myomata, on the whole, disturb the position of the ureters very seldom, but retro-peritoneal growths will do so to a marked degree.¹

Pressure.—Kelly and Cullen found hydro-ureter, attributable to pressure, in eleven of their operation-cases, but these ducts were not dilated in their case of a myoma weighing 89 lbs. In 148 autopsies in which myomata were discovered, Welch found hydro-ureter in five, one being associated with diffuse nephritis.

It is obvious that pressure on the ureters is more a question of the position than of the size of a tumour. A growth in the pelvis, large enough to fill the basin and become impacted, is the one likely to exert pressure on these ducts by compression against the bony pelvic brim.

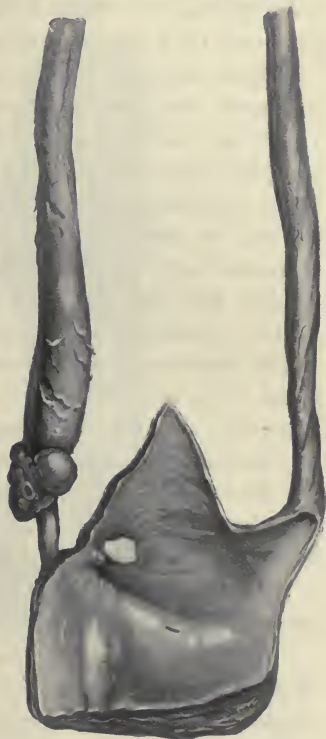


FIG. 114.—Ligature of right ureter and puncture of the bladder, an accident which happened during hysterectomy for burrowing sarcoma of the uterus.

¹ Jolly records a case in which a twisted myomatous uterus became impacted in the pelvis and led to displacement and blocking of the ureters, double surgical kidney, and death from uraemia resulted.

I have seen a case of hydro-ureter in which the duct was at first taken to be a fairly large-sized broad-ligament cyst; but only once have I discovered the condition in operating for uterine myomata.

Operative Accidents to the Ureter.—Accidental ligation and division are liable to occur (1) when the ureter is displaced by a burrowing tumour; (2) at the site of ligation of the uterine or ovarian artery.

When displaced, the duct may be ligatured on the front aspect of the tumour, or laterally at the level of the pelvic brim. I have twice included it with the *ovarian* vessels, in a ligature passed at the level of the brim of the pelvis. An example of accidental ligation at the level of the uterine artery is seen in Figure 114, already referred to under accidents to the bladder. In this case commencing hydro-ureter is seen, but the fatal issue was due to the wounded bladder and not to the obstructed ureter; indeed, as Bland-Sutton has stated, it is very probable that many surgeons have tied the ureter during an operation for the removal of a "meso-metric" (intraligamentary) myoma without ever having knowledge of the fact. In this connection it may be stated that I have thrice tied the proximal end of the ureter as an alternative to removal of the kidney, without any untoward result occurring; and three other cases are known to me where the operator's experience was similarly favourable after intentional ligation of the cut ureter.

Division.—In over two hundred operations for myomata I have once accidentally divided both ureters. The right kidney was removed, and the left ureter was implanted into the bladder, and the patient made a good recovery.

The injuries to which the ureters are exposed in the course of removing the uterus are given by Bland-Sutton as follows:

(1) One or both ureters are sometimes included in the ligatures applied to the uterine arteries (see Fig. 114); (2) one or both ureters have been cut or completely divided on removing the uterus; (3) a piece of the ureter (as much as 7 cm.) has been excised; (4) a ureter has been transfixed by a needle and thread when suturing the layers of the broad ligament; (5) a tumour arising from the lower part of the pelvis, between the layers of the broad ligament, will sometimes carry the ureter over its crown like a strap; in this position it may be mistaken for an adhesion; (6) in vaginal hysterectomy the ureters have been accidentally clamped.

Appearances of the displaced Ureter.—As already stated, the ureter has at times been divided between two ligatures, under the impression that it was a dilated blood-vessel; a few words, therefore, on the abnormal appearances which this duct may assume when it has undergone displacement and obstruction, complete or partial,

may not be thought to be superfluous. Figure 115 shows a ureter which has been dilated to the size of a segment of small intestine.

The strap-like appearance mentioned by Bland-Sutton is due to a thickening of the peritoneum, caused by peri-ureteritis. The converse, *i.e.* the resemblance of a fold of peritoneum to the ureter, often proves a bugbear, and necessitates a



FIG. 115.—Showing the presence of two ureters which were situated on the right side of the body. One of the pair is dilated from obstruction by a calculus. A bristle is inserted into the normal ureter. The large ureter caused a cystic swelling in the right broad ligament, which was at first regarded as a broad-ligament cyst. A calcified uterine myoma and a solid ovarian tumour were removed in the same case. A=posterior view. B=anterior aspect.

subsequent search for both ureters after the removal of a burrowing myoma. During enucleation of an intraligamentary growth, the capsule is often adherent along certain lines of cleavage, or the true line of separation may not always be hit off. It may then happen that a cord-like portion from the surface of the tumour is found in the capsule, and this may resemble a duct, sufficiently to create a scare in the operator's mind lest he might have had an accident with the ureter.

The obliterated hypogastric artery may be found cut across in the thickened peritoneal sheaths of the broad ligament, which have been separated from the tumour during enucleation, and the finding of these fibrous cords may arouse the suspicion that injury has been done to the corresponding ureters.

In all cases of doubt, the question as to the integrity of these ducts must be settled before the abdomen is closed. The suspicious fold of peritoneum or the suspicious structure, whatever it be, should be gently stroked up and down its long axis to elicit Kelly's sign of *vermicular contraction of the ureter*—and it is best also to make a determined search for the ducts and to trace them from the brim of the pelvis to the bladder. Cullen draws attention to the “delicate tracery of vessels” so characteristic of the ureter (see Fig. 115). As a last resort the above author points out that if the operator “feels relatively sure that it [the ureter] has been tied, he can split the bladder and introduce a renal catheter through the ureteral orifice. This will not lengthen the operation by more than fifteen to twenty minutes, and may be a life-saving procedure.” The injury to the ureters was located in this manner in two of the Johns Hopkins Hospital cases.

POSITION OF THE PELVIC COLON

As in the case of the bladder, the rectum is liable to displacement caused by the growth of myomata and to injuries during operations for their removal. Adhesions to the rectum are common in cases of myomata complicated by tubo-ovarian inflammation, and in the presence of pelvic abscess they may be very dense and intimate. The rectum may be found adherent to the back of a fibromyoma of the cervix below the peritoneal reflexion, whilst the peritoneum of the bowel and that of the tumour may adhere at any point. Kelly and Cullen give an illustration of this, showing large vessels passing from the one to the other.¹

Burrowing myomata may open up the meso-sigmoid, carrying the corresponding part of the pelvic colon upwards into the abdomen, where it will overlie the surface of the tumour. The rectum may be pushed to the right by this class of growth, so as to enter the pelvis to the right side of the median line. As the result of dense adhesions the rectum is frequently lacerated in these cases; many of these injuries fortunately involve the serous and muscular coats only; and most of them occur low down below the peritoneal reflexion. In the worst examples the mucosa is lacerated and the lumen of the bowel exposed; this happened in five cases reported from the Johns Hopkins Clinic. Kelly and Cullen advise that in cases where the

¹ *Myoma of the Uterus*, p. 42.

rectum is welded to the cervix or to the lower part of the uterus, bisection of the latter should be made in order to get at the adhesions from below. Another alternative is to dissect back the bladder and amputate the cervix.

It is better to leave a portion of the tumour on the rectal wall, than to run the risk of tearing the bowel; the area may then be excluded by making the peritoneal closure of the pelvic floor at a higher level.

A raw area should never be left, but should be inverted upon itself by interrupted mattress, or by Lembert's sutures. When the lumen of the bowel is opened, two rows of stitches are necessary for closure; fine silk, or Pagenstecher's thread, forms the best suture for the mucous membrane, and fine catgut may be used for the covering sutures.

Occasionally it becomes necessary to resect a portion of bowel, but in the writer's experience this has only occurred with *adenomyomata* and never with *fibromyomata*. After closure of a complete laceration of the rectum or sigmoid, the nurse must be specially cautioned not to give an enema.

Displacement of the rectum downwards is a very rare accompaniment of uterine myomata, far less so than is cystocele.

Pelvic abscesses when accompanying myomata of the uterus sometimes open into the rectum; two of my own cases gave a history of this occurrence, and in one an ovarian abscess was found together with dense peri-rectal cellulitis; this patient died of peritonitis after the performance of hysterectomy.

Cases of cancer of the rectum in conjunction with fibromyoma of the uterus have been met with. In three instances I have resected the bowel thinking that cancer was present; in one there was chronic induration only, and the other two were cases of adenomyoma.

MYOMATA IN RELATION TO PREGNANCY

Pregnancy is most liable to be complicated by myomata in women over thirty years of age. Women who are the subjects of uterine myomata are less liable to conceive than those who are not thus afflicted; the presence of these tumours is a cause of relative sterility. If it were not so, this inimical association would be much more common than it is. There can be no doubt that conception does not readily occur in a myomatous uterus, and it is not uncommon to find a myomatous subject pass through many years of sterile wedlock before becoming pregnant for the first time. It is largely the spinsters and sterile wives who come to the gynaecologists suffering with uterine myomata. I have, however, removed a large myomatous

uterus from a woman who had borne eight children. The growth was interstitial, soft, fatty, and had undergone red degeneration.

Subserous myomata do not as a rule exert any retarding influence upon conception; they show very little tendency to affect the uterine cavity in any way, and their natural propensity is to part company with the uterus altogether and acquire other sources of nutrition.

Although subserous growths cannot be proved to influence conception, and are often quite innocuous to pregnancy, labour, and the lying-in period, they may nevertheless lead to serious complications at any stage of gestation as the result of twisting of a pedicle, and also by descending into the pelvis and so causing impaction. In the case of sessile subserous growths which are too large to enter the pelvis, it may be said that unless they distort the uterine axis and cause an abnormal lie of the child or actual obstruction, or undergo secondary changes and acquire adhesions, it is not likely that they will disturb the course of pregnancy and labour. From their mere bulk they may hasten the expulsion of the uterine contents, but even when they are very large, there is little inclination for them to cause premature labour, owing to the space provided by the yielding of the anterior abdominal walls.

Myomata which burrow in the pelvic cellular tissue or become submucous behave in relation to the reproductive process very differently from those which become subserous and rise out of the pelvis; from the obstetric standpoint interest is centred in the retroperitoneal and submucous growths.

Interstitial, retroperitoneal and submucous myomata do not prevent conception, but they are a distinct hindrance to its occurrence, and, as stated already, long periods of sterility may supervene before a married woman, who has such a growth, falls pregnant. This leads to many surprises both to patients and to surgeons; the woman with a myomatous uterus has long considered herself immune as regards conception, and has abandoned any hope of maternity which she may have had in early married life. The surgeon mistakes the enlargement of recent date for that due to the various types of degeneration to which these growths are prone; the true nature of the complication is then discovered only after hysterectomy—indeed there is hardly any surgeon of considerable experience who has not been baffled in diagnosis by cases such as these.

It is obvious that the more a myoma encroaches on the uterine cavity, the more is it likely seriously to interfere with conception and with the progress of gestation.

The tendency to abortion in the presence of submucous growths is favoured

(1) by the uterine contractions which these growths set up, (2) by expansion of the uterine cavity caused by the tumour, and (3) by the frequent association of an unhealthy hyperplasia of the endometrium; and this last is probably a hindrance to conception likewise. Consequently of all myomata the submucous variety is most prone to hinder impregnation and to favour abortion. From their exposed position submucous myomata are exceedingly liable to septic infection, necrosis, and sloughing.

Why interstitial tumours, which do not invade the cavity, so frequently delay conception, is not so easily explained, unless endometrial changes are invoked to account for the fact.

Diagnosis.—Diagnosis of the associated condition of myoma and pregnancy varies in difficulty, according to the age of gestation and the size of the new growth: the more recent the conception and the larger the tumour the more difficult becomes the diagnosis. In one of my own cases there was a history of miscarriage followed by continuous haemorrhage; a tumour reaching above the umbilicus was diagnosed as a myoma; the operation revealed a four months' foetus in a uterus lying on the top of a large cervical myoma (see Fig. 117). In a case of Alban Doran's the myoma was as soft as the pregnant uterus and gave as loud a souffle, but the large size of the tumour precluded the diagnosis of twin pregnancy in the two halves of a bicornute uterus (see Fig. 118). In Meredith's case, which is shown in Figure 116, the *gestation-sac* happened to be low down and was felt in the pouch of Douglas with the myoma above it; the diagnosis of pregnancy was therefore made on physical examination.

The diagnosis of *pregnancy* is seldom difficult or at fault; it is more certain than that of the *tumour*. Scipiadès states that only in two-thirds of the cases can the presence of myomata be diagnosed with certainty, since it is so easy to confuse the abnormality with other conditions, such as ectopic gestation, uterus bicornis, twins, and other tumours, notably ovarian. The diagnosis of the lie of the foetus is often difficult; abnormal presentation is very common. Abnormal uterine gestation, *i.e.* moles, either carneous or vesicular, may simulate myomata, and soft solitary myomata are in their turn frequently regarded as the gravid uterus (see "General Diagnosis," pp. 277 and 279).

Prognosis.—Scipiadès states that operation becomes a necessity in from 30 to 33 per cent of cases, and as the operative interference frequently results in abortion, he estimates that scarcely more than one half of the pregnancies go to term. Taking this view, together with his expressed opinion that myomata *per se* do not favour abortion, it would seem that he blames surgical interference for a high

foetal mortality, which is an impression to which I must take exception. There is no doubt that the prognosis varies with each individual case.

Scipiadès¹ has found that the course of *labour* is delayed. In the first stage dilatation of the cervix is especially interfered with by impacted cervical myomata, premature rupture of the membranes occurring in three-fourths of all cases. Breech and transverse lies also contribute to delay in the first stage; the second stage of labour is not delayed, but is more painful. The third stage is abnormal in 21 per cent. of cases, Credé's expulsion or manual delivery becoming necessary. Without exception, submucous myomata always cause trouble in the third stage of labour. The most dangerous complication is haemorrhage; post-partum bleeding being frequent.

G. T. Harrison² expresses the opinion that the dangers of myomata to pregnancy, labour, and the lying-in state are over-estimated, and that too many operations are done for this complication. He says that large and multiple myomata of the uterine body cause no trouble, and that growths lying deep in the pelvis are drawn up; but the admission is made that cervical myomata are dangerous, and the risk of post-partum haemorrhage is also acknowledged. *Expectancy* is advised by Harrison, and Caesarean section must not be performed too early, it being this author's view that it is important first to get the effect of the pains; but the operation must not be deferred too long, for fear of adding to the risk of sepsis. Harrison agrees with the French authors that forceps are dangerous, but he goes further, and denounces turning and extraction as well.

Effects of Pregnancy on a Myomatous Tumour

From the pathological standpoint it has already been pointed out that 'red degeneration' of myomata is particularly associated with pregnancy in the mind of the clinician, partly because this form of necrosis is more frequently seen in uteri which are gravid than in those which are not, and partly from the fact that pain and enlargement of the tumour are concomitant. Leith Murray considers that the pain and enlargement vary with the amount of the thrombosis present in the vessels of the tumour.

Since 'red degeneration' of myomata occurs more frequently in pregnancy than in any other condition, it has most naturally been concluded that pregnancy is a predisposing factor in the causation of this particular type of degeneration; but

¹ Scipiadès, "Myom und Schwangerschaft," *Abhandl. an der Geb. d. Geburts. und Gynäk.*, Bd. ii. H. 2, S. 201.

² *Virginia Med. Semi-Monthly*, vol. lxxvii. No. 24, p. 601.



FIG. 116.—Showing a foetus of nearly four months, lying beneath a large myomatous uterus. The pregnancy was diagnosed before operation.

in favour of the latter being due to a merely local condition in the tumour itself, is the fact that only a single myoma out of many may be affected. Although very small myomata are liable to undergo hyaline change, this degeneration is more marked, as a rule, in the larger growths than in the small ones; and since the phenomenon of haemolysis is dependent, according to Leith Murray, upon pre-existing hyaline and fatty degeneration, it follows that we are most likely to find red haemolytic change in large tumours, whilst the smaller escape.

This statement accords, as far as my experience goes, with the behaviour of interstitial and submucous tumours, but not with that of large subserous growths; but this may be due to the limited material obtainable for observation, since it has been quite exceptional for me to get an opportunity of examining a subserous growth during or immediately after pregnancy, only one instance coming to hand, and in this there was no red degeneration at all.

Many writers think there is actual growth of myomata during pregnancy, and there is no doubt in the minds of most observers that these tumours often show a distinct increase in size, but pathologists attribute this enlargement to oedema and other secondary changes. Disappearance of myomata after labour is unproven.

Twenty-one cases of myomata complicating pregnancy, labour, and the puerperium have come under my personal observation (see Table, p. 259). Eight of these were under the care of various colleagues, the remainder were in my own practice. Nine of these cases have already been recorded.¹ Caesarean section at term was performed in three cases, and the uterus was in each instance removed by sub-total hysterectomy: in one instance the tumour was the size of a large grape-fruit, and was situated in the supravaginal cervix; in the other two cases the tumour was a burrowing myoma attached to the lower segment. In four cases hysterectomy—at four months (Fig. 116), 4½ months (Fig. 117), five months (Plate XXIV.), and 5½ months (Fig. 118) respectively—was performed, urgent symptoms having arisen in each case.

In two instances sub-total hysterectomy was performed for profuse haemorrhage following abortion.

In three cases conservative myomectomy was done: once at the fourth month, once at the sixth month, and once this operation was performed as a Caesarean myomectomy at term.

In five of the twenty-one cases the tumour was *submucous*. In (1), the myoma sloughed in the puerperium but came away without operation; the patient was

¹ *British Medical Journal*, Oct. 22, 1910.



Showing a myoma of the posterior wall of the cervix in a state of red necrosis. The uterus contains a fetus of five months development. (Published by the operator, Alban Doran. *Lancet*, Vol. II, p. 1451. 1902.)



FIG. 117.—Showing a cervical myoma beneath a uterus which contains a 4½ months' foetus. The necrotic area was nearly black in colour, and showed multiple thrombi.

gravely sapraemic for many weeks. (2) A second case of this kind was of great interest. After a miscarriage at $6\frac{1}{2}$ months, the uterus remained at the umbilicus, and the patient ran a high intermittent temperature for four weeks. She was an inmate of St. Pancras Infirmary, and the above was the history when I saw her. On examination there was every evidence of prolonged septic absorption—lemon-coloured skin, typical temperature chart, foul vaginal discharge, and a tender uterus reaching to the umbilical level. The os admitted two fingers, and the lower pole of a soft growth could be felt. This I proceeded to remove, and in doing so my exploring finger passed through the soft stretched-out capsule at the fundus. It was only on drawing down the growth and inverting the uterus with it that I found I was delivering growth, uterus and all. Vaginal hysterectomy was performed and the patient recovered. (3) In the third case myomectomy was performed *post abortum*, the indication for interference being haemorrhage and sepsis. (4) In the fourth case the growth was extruded in front of the placenta, and was afterwards thought, by the doctor who attended the patient in her confinement, to be the placenta. Labour had been spontaneous at $6\frac{1}{2}$ months' gestation; the child lived two days. There was no post-partum haemorrhage, but the lochia were still red three weeks after delivery, and acute attacks of hypogastric pain occurred frequently. The temperature on the evening of the second day was 101° F., and it remained high until the fourteenth day; the highest pulse-rate had been 112. There was troublesome constipation, but no dysuria. The fundus was 3 inches below the umbilicus, and to the right was a hard sessile mass which was tender. After the birth of the child a large ovoid mass with membranes attached had come away, and then a tiny placenta, much smaller than the mass, was expressed. I advised admission into the Great Northern Hospital, but the husband had the patient admitted to another hospital, where hysterectomy was performed; a large myoma was found in the uterus. Peritonitis set in forty-eight hours after the operation, and ended fatally. (5) In case five, abortion occurred at $2\frac{1}{2}$ months, and severe haemorrhage took place necessitating exploration. The placenta was tucked away above a submucous myoma, and its removal was extremely difficult owing to the obstruction caused by the growth.

The last case in my personal series is one in which sub-total hysterectomy was carried out at $3\frac{1}{2}$ months' gestation. The patient was a widow, aged 39 years, and had missed three periods; she complained of great pain in both groins, also of frequency of micturition. There was a myoma in the anterior wall of the uterus pressing on the bladder, and another in the right iliac fossa just above Poupart's ligament. I advised myomectomy on account of the bladder-symptoms, but the

patient saw another surgeon, who removed the gravid uterus and reported that he found 'pus' in one of the tumours.

Treatment.—Pregnancy complicated by myomata is a subject of the greatest importance for both obstetrician and gynaecologist. The practice of obstetricians



FIG. 118.—Showing a gravid uterus of 5½ months with a large subserous myoma growing from its left border.
(Operator, Alban Doran, *vide Edin. Med. Journ.*, Sept. 1903.)

was formerly to induce abortion if the myoma was so situated as to ensure its being an insuperable barrier to labour at term, whilst those cases were left to nature, in which, after due consideration, the tumour was considered innocuous owing to its safe position above the pelvic brim, or where it was found that a pelvic tumour

could be pushed out of the way. A great deal was accordingly learned as to the possibility of myomata ascending into the perfectly safe upper regions of the false pelvis or into the abdomen during the course of pregnancy and even during labour itself.

The influence of these observations as to the result of conservative measures has been enormous on the present-day treatment of this interesting obstetrical complication, and surgical interference is now usually withheld unless enforced by the intervention of urgent symptoms. A change of view has occurred in obstetric practice with regard to the frequency with which abortion is induced for pregnancy complicated with cervical, retroperitoneal, or impacted myomata, *i.e.* tumours which are destined to obstruct labour at term. It cannot be stated that the value of a living child to the parents and to the State was ever lost sight of by the older obstetricians, but the advances of modern surgery have opened up methods of saving child-life, which only a short time ago would have been denounced as unjustifiable, because unsafe to the mother.

The induction of abortion is difficult and dangerous: it may lead to uncontrollable laceration, also to sepsis and necrosis of the growth; therefore as a line of active treatment for pregnancy complicated by obstructing myomata it is let us hope, a relic of bygone days, no longer to be recommended, unless under exceptional circumstances.

In cases where intervention becomes essential the modern treatment comprises the adoption of one of the following courses: (1) doing nothing operative until full term, and then performing Caesarean section (conservative, or otherwise); (2) removing obstructing or degenerate growths by myomectomy during gestation; (3) when myomectomy is impossible, removing the pregnant uterus, tumour and all.

That the gravid uterus will tolerate careful and skilled operative interference is a well-established fact, a fact which gives myomectomy during pregnancy a lasting place in surgery. Experience has also proved that removal of the pregnant uterus carries with it no special risks, other than those attendant on hysterectomy generally. Such treatment is certainly preferable to the induction of abortion or of repeated abortions.

There is no doubt whatever that the ideal treatment is to let the pregnancy go to term wherever possible, and then, if obstruction is insuperable, to perform Caesarean hysterectomy. The advantages of Caesarean section in saving child-life are obvious; the advantage of the hysterectomy is also patent, as the immediate risks of defective involution and of post-partum haemorrhage, and the dangers due to the disintegration of the growth and to sepsis, are avoided, to say nothing of

future obstetric risks if the patient should survive. If the growth is low down in the cervix, a *total* hysterectomy will be necessary; if the child is dead, *total* hysterectomy is advisable; in the absence of special indication for *total* removal of the uterus, *supravaginal amputation* is to be recommended on the ground that it takes less time to perform.

Caesarean myomectomy would appear to be the ideal treatment for obstructive myomata during labour, but until more experience of this operation is recorded, I hesitate to advise it. It is scarcely necessary to repeat that remarks on myomectomy apply to tumours low down, *i.e. the obstructing tumours*, and not to subserous growths above the pelvic brim; the latter, if degenerate, may be removed during pregnancy, but they do not indicate the performance of Caesarean section.

TABLE OF RESULTS OF TREATMENT IN TWENTY-ONE CASES OF PREGNANCY COMPLICATED BY MYOMATA.

Operation.	Cases. Totals.	Results.	
		Maternal.	Foetal.
Caesarean Section + Hysterectomy . . .	3	Recoveries	Children lived
Caesarean Section + Myomectomy . . .	1	Death	Child lived
Hysterectomy before term . . .	4	Recoveries	...
Hysterectomy (Abdominal) <i>post abortum</i> for haemorrhage . . .	3	2 Recoveries; 1 Death	...
Hysterectomy (Vaginal) <i>post abortum</i> for sepsis . .	1	Recovery	...
Myomectomy (Abdominal) before term . . .	2	Recoveries	Normal labour, children lived
Myomectomy (Vaginal) <i>post abortum</i> . . .	1	Recovery	...
Placenta removed . . .	1	Recovery	...
Pelvic abscess opened after delivery at 8 months	1	Recovery	...
No operation in 4 cases: normal labour	4
Total . . .	21		

Myomata and Extra-uterine Pregnancy.—For those who hold as I do that salpingitis favours the occurrence of tubal pregnancy, it is easy to infer that there is a remote causal relationship between myomata and tubal gestation, the frequency with which these tumours are associated with salpingitis pointing in this direction.

Sciapiades, in a recent paper on the subject of myomata and pregnancy,¹ states that in 2.5 per cent of cases the pregnancy is extra-uterine. In my own series of 210 operations for myomata the association of extra-uterine pregnancy with myomata was twice seen.

In one instance the myoma was not thought of, as the symptoms of the ruptured tubal sac completely masked those which the uterine tumour may have occasioned.

¹ *Locus supra cit.*

In the other case the myoma was enveloped in a densely adherent false capsule which also contained foetal bones—the adventitious sac resembled thick leather; its removal was impossible, so it was packed and marsupialized to the abdominal wound. There had been a history of a “false labour” eighteen years before operation. The diagnosis before operation was that of an impacted burrowing myoma; the foetal remains came as a surprise in dissecting the specimen.



FIG. 119.—Myomatous uterus and tubal pregnancy.
The uterus has been opened up and shows a decidual membrane *in situ*.

The details of my second case are as follows:

A. S., aged 36, was first seen on March 29, 1907. Catamenia began at thirteen years, had always been regular, lasting four days, not excessive, not painful; the last period occurred two months previously.

The patient was childless after ten years of wedlock. A month before examination there was pain in the lower abdomen, which lasted one week and then ceased. Six days previously to being examined it started again, very severely, after coitus, and continued, though less intense, since. Examination revealed a tumour to left of the mid-line, extending to 1 inch above the umbilicus and filling up the left side of the lower abdomen;

it was dull to percussion, not notably tender; its outline was difficult to define owing to the thickness of the abdominal wall.

The cervix was high up behind the pubes and difficult to reach. The tumour did not fill the pelvis, and no definite lower limit of it could be felt. My diagnosis was extra-uterine pregnancy or a twisted ovarian cyst. March 30, 1907, Laparotomy. The tumour consisted of a large uterus containing multiple myomata. On its right side was a gravid tube which had ruptured; it was attached to the uterus and to the broad ligament. There was much blood-clot in the pelvis, and on disturbance the bleeding started afresh.

The myomatous uterus together with the right tubal gestation were removed *en masse* by Kelly's hysterectomy. The patient recovered. The uterine mucosa showed decidual change. The specimen is seen in Fig. 119.

Secondary abdominal pregnancy of four years' duration is a rare condition discovered by Cullen whilst operating for what he had regarded as an adherent myoma; in this instance as in my first case (*l.s.c.*) no heed was paid to the patient's statements of a spurious labour.

CLINICAL FEATURES OF MYOMATA

Frequency.—Myomata of the uterus are probably the commonest tumours to be found in any part of the human body. Of 150 consecutive uteri which I collected from the post-mortem room of Charing Cross Hospital, 30 contained myomata. It has been stated that one-eighth part of all gynaecological cases are made up of patients suffering from uterine myomata. As regards the relative frequency of myomata in the body and in the cervix uteri, Schröder says that 91·9 per cent occur as *corporeal*, and 8·1 per cent as *cervical* growths. Myomata appear to be even more common among negroes than among white women.

Age.—The statement that all elderly virgins have myomata is probably an exaggeration, and Klob's view that 40 per cent of all women over forty are the subjects of this disease is possibly an over-estimation.

As regards the time of life at which myomata make their appearance it may be stated:

- (1) That they have never been shown to appear before puberty.
- (2) That they may arise at any time during sexual life.
- (3) That they do not arise *de novo* after the climacteric.

Clinical evidence of a uterine myoma may be first established after the menopause, owing to some change, such as necrosis or malignancy, occurring in the previously unobtrusive tumour. The youngest patient recorded as suffering from a uterine myoma was seen by Cavaillon and was aged 13 years; the growth after removal was pronounced to be histologically an innocent myoma. Myomata are most likely

to cause trouble, and require treatment between the ages of thirty-five and fifty-five years. Most of the operations for these growths take place during this period.

Sterility.—B. Phillips of Amsterdam found that nearly 30 per cent of married women with uterine myomata were sterile, and that of those who were fertile the average number of children in each family was 3.25. The conclusion drawn by Phillips is that myomata are a hindrance to fertility, and the frequency of abortion is increased by their existence. With subserous growths abortion is less frequent and fertility relatively high. Phillips finds that the intramural variety of growths preponderates in sterile married women.

Menopause.—A notable clinical feature of myomata is that they cause a postponement of the menopause, so that whilst the average age at which the ordinary women ceases to menstruate may be put down at about fifty years, patients with myomata frequently menstruate up to the age of fifty-five or even later.

SYMPTOMS OF UTERINE MYOMATA

There are myomata of even considerable size which cause no symptoms whatever. With what frequency these occur is unknown, but it is certain that a myoma is compatible with perfect health and that its existence is often discovered only by accident. On the other hand, the symptoms to which it may give rise are many and various; indeed it may be generally stated that there is a tendency for myomata, which for many years have been harmless, subsequently to give rise to symptoms more or less severe, so that it is exceptional for the subjects of these tumours to escape from some or other of the effects which they are capable of causing.

Primarily, the symptoms which we may expect to find comprise haemorrhage, leucorrhoea, pain, pressure-symptoms, and interference with conception, pregnancy, labour, and the puerperium. *Secondarily*, anaemia, constipation, dyspepsia, and neurasthenia make up a picture of chronic ill-health. Acute and sub-acute abdominal disturbances may occur; further, symptoms due to changes in the growth, or to mechanical disturbances of the circulation may set in; and, finally, sudden and oft-repeated retention of urine may be caused by impaction. These will be considered separately.

1. Primary Symptoms. (1) *Haemorrhage.*—Hospital patients call myomata “bleeding tumours,” because menorrhagia is the commonest symptom, yet it is by no means of constant occurrence. It is dependent upon increased size of the uterine cavity and upon the association of hyperplasia, and, in some instances, of inflammation, of the endometrium; or upon the imperfect uterine contraction due

to the presence of mechanical obstruction ; or upon the presence of a polypus, either mucous or myomatous.

Haemorrhage is further favoured by the intervention of degenerative and malignant changes in the growth. Generally speaking, the more intimate the relationship between a myoma and the uterine cavity, the more pronounced is the haemorrhage, so that submucous (stalked and sessile) growths are most prone to set up bleeding ; interstitial growths do so to a less degree, whilst subserous and intraligamentary tumours, not influencing the cavity at all, may cause no bleeding whatever.

As already stated, the type of haemorrhage due to myomata is that of menorrhagia or excessive monthly periods. In extreme cases the flow is both excessive and prolonged ; in less severe instances the duration is normal but the daily loss increased ; or the total loss may be in excess owing to the period lasting for an abnormal time, so that the " clear " interval may be reduced to ten days or even less, with a loss of rhythm in the periodicity : indeed in the worst cases scarcely any free interval is obtained, but only a diminution in the intensity of the loss, and patients may even die as the result of the haemorrhage. In these extreme cases the patient is pale—waxy pale—with a transparent skin ; there is puffiness of the feet and ankles, and breathlessness ; the haemoglobin may be reduced to 20 per cent or lower. These are all signs of loss of blood, and may occur quite independently of malignant changes.

From the anaemia follow secondary symptoms which will be considered later.

Mention has already been made of the continuance of menstruation beyond the average date of the menopause. This clinical feature is not confined entirely to those growths which cause the most pronounced menorrhagia, viz. the submucous variety ; it is a common feature of every variety of myomata. In this connection it may be mentioned that the etiology of myomata and that of the haemorrhage which is associated with them are regarded by some speculative minds as dependent on a single factor, namely, an aberration of ovarian secretion.

(2) *Internal haemorrhage* from myomata has been recorded by Spencer, Bruce Clarke, and Cullen. This occurs from the large veins which spread themselves over the surface of ' parasitic ' myomata, and which are liable to become varicose, and possess, at best, only very thin walls.

(3) *Leucorrhoea*.—When the intermenstrual period is of some considerable duration, it is quite common to get a leucorrhoeal discharge. This is an excessive whitish or yellowish discharge, which is often tinged with blood, just before and after the period ; it is a common, but not an important symptom. The hyperplastic condition of the endometrium in cases of myoma, which has already been referred

to, will account for the excessive secretion from the cavity of the uterus, and to this is often added the discharge from coincident cervical catarrh and erosion. Departures from the common mucous or muco-purulent type may occur with secondary changes in the tumour. Thus with cystic growths the discharge may be thin, watery, and sometimes tinged with blood; with a sloughing submucous myoma the discharge is putrescent and extremely nauseating. Sometimes a thin watery discharge is particularly irritating and sets up pruritus vulvae.

(4) *Pain*.—Pain is not an obtrusive symptom of myomata; when present it directs the clinician's attention to complications either in the tumour itself—in the nature of degeneration, malignancy, or infection—or to changes, often inflammatory, in the adjacent structures. Uncomplicated myomata may, however, give rise to a sense of weight and bearing down, and may be tender just before a period. They may cause definite pain in two ways: (a) by making the menstrual process painful; (b) by compression of the veins and nerves in their neighbourhood.

(a) *Dysmenorrhoea*.—Severe dysmenorrhoea is quite uncommon with uncomplicated myomata. It may be induced by excessive uterine contraction in the attempt to extrude a myomatous polypus, or in expelling large clots during excessive menstruation. Small myomata are much more likely to cause dysmenorrhoea than large ones; subserous growths cause neither haemorrhage nor dysmenorrhoea. With complicated myomata, menstruation is frequently painful, and this will be referred to later. When menstruation is painful, the pain does not precede, but is concomitant with the flow—when the pain is severe the presence of a polypus in process of 'delivery' may be suspected; the patient may then describe the symptoms as 'labour pains.'

(b) *Pain from Pressure*.—This may only amount to ill-defined abdominal discomfort, or more frequently there is pain in the back and across the hips and down the thighs; sometimes it is definitely localized, for example to one hip; in character it is usually a dull ache, but it may be sharp and even lancinating. Sometimes continuous nerve-pressure will cause cramp-like pain in the legs and feet, and this pain in the lower extremities may be put down to rheumatism; in other cases the pressure causes numbness and loss of sensation.

(5) *Other Pressure Symptoms*.—Symptoms due to pressure on viscera are important; they relate principally to disturbances in the functions of the bladder and of the intestines.

(a) *The Bladder*.—The anatomical displacement and structural alterations in the bladder which occur as the results of myomata have already been discussed; it now remains to mention the functional disturbances which are met with in certain cases.

In spite of the close anatomical relationship of the bladder and uterus, disturbance of the vesical function is a relatively infrequent symptom of myomata. The explanation is found in the free range of mobility afforded to the dilatable part of the bladder by the loose connective-tissue space which surrounds this viscus beneath the flaccid utero-vesical fold of the peritoneum. When a myoma during steady growth gradually ascends out of the pelvis into the abdomen, its effect upon micturition will be the same as that of a gravid uterus, *i.e.* before the growth advances above the pelvic brim it is liable to cause an increased frequency of the act, and after it has reached the abdomen, an uncomplicated myoma may cease altogether to irritate the bladder, and the frequency of micturition will pass off. The fact that the bladder has been drawn up with the growth seems to make but little difference to its function, since its capacity for holding urine is not encroached upon. It seems clear that, as long as diastole or expansion is not prevented, the bladder is very tolerant of displacement, whilst actual encroachment on its capacity at once brings about a necessity for a more frequent emptying of the viscus.

The commonest bladder-symptom is painless frequency of micturition. In rarer cases dysuria is an accompaniment; when the bladder becomes adherent and its walls pressed together, actual strangury may occur, but more commonly the 'pain' is just a feeling of discomfort and weight. Frequency of micturition occurs in about 7 or 8 per cent of the cases of myomata which find their way into the wards of a hospital, whilst frequency with tenesmus is far less common.

Retention of urine is a rare symptom. In a series of 210 hysterectomies for myomata I have on three occasions operated for acute retention of urine. Figure 120 shows one of the tumours which by being impacted in the pelvis had set up this untoward symptom. A submucous myoma in a retroflexed uterus will sometimes cause acute retention in exactly the same way as an incarcerated, retroverted, gravid uterus; the urethra is then not so much compressed as stretched, the lumen being obliterated by the process of stretching and elongation.

Mention has already been made of the effects produced on the ureters by chronic retention of urine, but it may here be stated that chronic retention and cystitis, and the sequelae relating thereto, are rarely seen in association with uterine myomata. Cystitis was only twice found in 1400 cases by Kelly and Cullen.

Incontinence of urine is sometimes caused by pressure of the uterine tumour on the bladder, but this is very uncommon. Urinary symptoms are more often noticeable just before, and during menstruation, at which times myomata can often be observed definitely to increase in size. Pressure on the ureter and displacement of the duct have been dealt with in a previous section (see p. 245).

(β) *Blood-vessels and lymphatics* in the broad ligaments may show signs of direct compression by myomata. The results are localized dilatation of both veins and lymphatics; these collapse on removal of the tumour, and therefore the condition is not seen in museums, but can only be appreciated by those present during an operation. From the same cause, oedema and varices of the lower extremities occur.

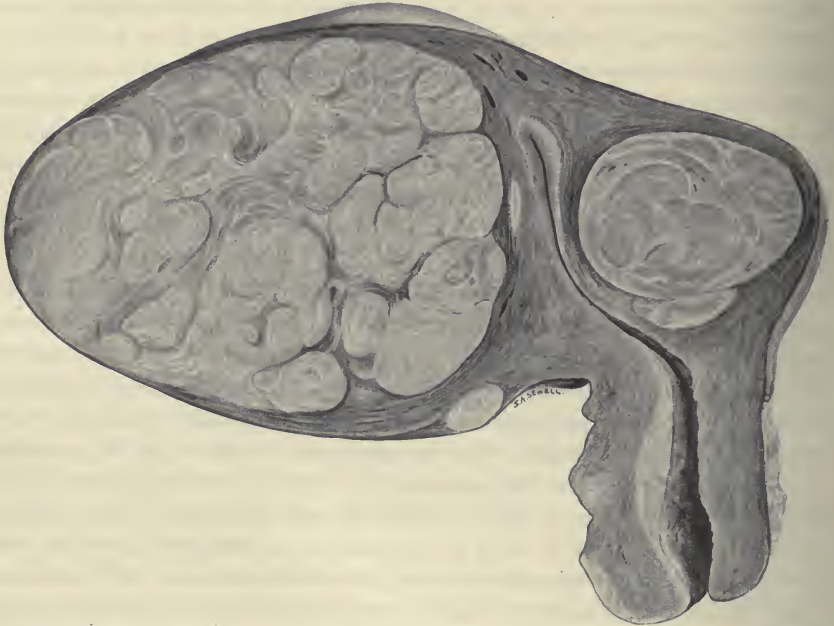


FIG. 120.—Showing a myoma of the posterior uterine wall. It was removed from a hospital patient on account of her suffering from acute retention of urine.

Haemorrhoids from pressure on the inferior haemorrhoidal veins are not uncommon. True thrombotic phlegmasia, due to clotting of blood in the external iliac and femoral veins, has been described, but this is very rare. Varicose veins of the vulva, and blue discoloration of the vaginal mucous membrane, have been noted in certain cases of myomata.

(γ) *The Rectum*.—Constipation is constantly associated with myomata of the uterus. Constipation and haemorrhoids are most commonly found in cases of cervical tumours, which type of growth may fit the pelvis so accurately that it is impossible for the rectum to escape from pressure. It is very rare, however, for the

haemorrhoids to be so severe as to necessitate their removal, and this should not be done at the same time as hysterectomy. As a rule these varicosities disappear after the removal of the myoma.

Dyschesia, independently of haemorrhoids, is sometimes produced by the pressure of a myoma.

(8) *Reflex neuroses*, such as nausea and vomiting, which are so common when a uterus is enlarged by pregnancy, are very rarely met with in uterine enlargement due to myomata. Such symptoms should make the surgeon think of adhesions and kinking of the bowel, and they may indicate the onset of actual obstruction; but this is a very rare complication of myomata—Cullen records a case where it was due to co-existing carcinoma of the sigmoid. Partial obstruction, however, is not so rare, and it is attributable to extensive adhesions between the bowel and the tumour; also to adhesions of the bowel to inflamed adnexa; and in some instances to an adherent appendix vermiformis.

The upper abdominal viscera, *e.g.* the stomach and liver, may be disturbed in their function by very large myomata which reach to the upper limits of the epigastrium. Such tumours also make their pressure felt upon the action of the heart and lungs, causing shortness of breath and various cardiac symptoms, but as these are not, as a rule (and in point of fact very seldom), due solely to the pressure, cardiac symptoms will be referred to under "The Heart in Myoma-Cases," p. 268.

(6) *Pain due to Complications*.—In addition to pain which is directly referable to the effects of pressure, must be mentioned the severe pain to which the presence of complications gives rise. As was seen in pages 240-244, the most frequent complication is coincident diseases of the tubes and ovaries. Chronic inflammation of these organs is likely to occasion more or less abdominal pain and discomfort, together with recurrent attacks of pain of a severe character. Suppurative inflammation in the tubes and ovaries may cause acute abdominal symptoms, difficult at first to distinguish from an acute infection of the appendix or gall-bladder. As has already been pointed out, ovarian cysts, either true neoplasms or blood-cysts (lutein haematomata, see Fig. 113, p. 243), may co-exist with uterine myomata, and should they do so, the tendency is for these adnexal structures to acquire adhesions in the pelvis, which will anchor them in this situation; and when this is the case, they become very painful and tender.

Again, complications which arise within the tumour itself form another source of pain. This is most marked in the case of infection of the tumour, a condition to which submucous myomata are mostly prone. An acute infection in a submucous growth may give rise to acute pain as well as fever. Subserous and interstitial

growths, though unexposed to external sources of microbial invasion, do not escape infection. Chronic infection leading to peritoneal adhesions and fixation of the growth is, when present, always a source of pain, generally of a subacute and constant character; this type of pain is aggravated before, and at the beginning of, the menstrual period. Infected myoma are always a source of pain; but aseptic necrosis of the growth is also in many instances a source of pain likewise; *e.g.* in certain cases, of which Figure A, Plate XVIII. is an example, the tumour whilst undergoing fatty necrosis of the red type (necrosis with haemolysis) caused pain and was also extremely tender, so that the patient resented its being touched. The cause of the pain and occasional fever is not clear, but the same occurs in the case of sarcomatous metaplasia, even when, as with red necrosis, there is no plastic peritonitis present.

Torsion of the stalk of a *subserous* myoma is a source of pain, which in certain rare instances may be very severe. Later on these twisted tumours cause pain from the adhesions they acquire whilst undergoing necrotic changes consequent on stasis.

Speaking generally in regard to the symptom of pain in cases of myomata, it must be confessed that it is often impossible to distinguish, from the clinical character of the pain, the nature of the complication to which it is due; associated tenderness is no helpful guide, for an adherent tumour is tender, the tenderness being peritoneal, whilst a non-adherent necrotic myoma, as has been stated already, may be equally tender.

2. Secondary Symptoms.—The symptoms to which myomata give rise, when present as a complication of pregnancy, labour, and the puerperium, were discussed under a separate heading (see p. 251). We now pass to the consideration of secondary symptoms, and of these the most important is *anaemia*.

Anaemia.—This symptom is most marked in subjects of a submucous growth, since this is the type of growth which causes the greatest amount of haemorrhage.

Kelly and Cullen draw attention to the beneficial effect of rest and general treatment before operation; in this way they were able to raise the haemoglobin from 10 to 21 per cent, and from 15 to 46 per cent before operation. Experience has proved that anaemia in the absence of sepsis need not be feared by the surgeon, but if it is associated with infection, surgical operations are often fatal.

Intimately associated with anaemia are certain cardiac changes. We must therefore devote a short space to this subject.

The Heart in Cases of Myomata.—Max Herz¹ has written on the subject of

¹ Max Herz, *Wiener medicinische Wochenschr.*, Jahrgang 63, N. 22, S. 1355, 1913.

“Kropf-herz, Myom-herz, Klimax-herz,” but to the question, Is there a myoma-heart? “the answer is in the negative.”

Fatty degeneration, brown atrophy, and cloudy swelling of the heart-muscle occur, but these changes are all referable to the anaemia produced by menorrhagia and prolonged loss of blood.

F. Masselot and H. Vignes in an article (“Comment il faut surveiller un fibromyome utérine”)¹ speak of a specific heart-lesion among the complications of uterine myomata, but Bland-Sutton, Leopold, and Kelly agree that the cardiac changes and symptoms are due to anaemia, *i.e.* that they are functional, and clear up as soon as the haemoglobin percentage is raised to normal. In Kelly and Cullen’s series of over 1200 cases there were 92 cases of impaired cardiac action; these authors give a record of the varieties of cardiac sounds which were noted. The predominant feature was a soft systolic murmur at the apex. Cardiac dilatation, especially of the right auricle, was noted by Hofmeier and Fehling. Myocarditis was found at an autopsy by Welch, but it was not clear that myoma was the cause.

The cardiac symptoms are most marked in the cases where there has been most pronounced haemorrhage, *i.e.* submucous growths, and are not in any way dependent on the size of the myoma. This completely answers the question as to whether a myoma generates toxins inimical to the heart, and refers the cardiac lesion back to anaemia. The clinical proof that a ‘myoma-heart’ is an anaemia-heart is afforded by the fact that the heart-symptoms disappear *pari passu* with the anaemia.

DIAGNOSIS OF UTERINE MYOMATA

I. Physical Characters.—Myomata usually occur as multiple tumours—more rarely they are single; they may form nodular tumours, whilst, again, they may be quite smooth.

(a) *Size and Shape.*—In size these tumours vary from microscopic nodules up to a mass large enough to distend the whole abdominal cavity. In shape myomata are round, as a rule—less frequently oval; the spherical development is dependent on the muscular capsule, but various influences alter the fundamental shape.

(b) *Consistence.*—As a rule a myoma presents as a solid inelastic growth, but it may be hardened from calcification, or softened by degeneration, and even elastic from cyst-formation.

(c) *Mobility.*—The range of movement possible to an uncomplicated myoma varies with the intimacy of its attachment to the uterus. An interstitial or sessile growth will possess mobility corresponding to the range of the uterus itself and

¹ F. Masselot and H. Vignes, *La Gynécologie*, Ann. 17, N. 11, 640, 1913.

varying only with its size and relation to the pelvis. A pedunculated subserous growth may move all over the abdomen, its freedom varying with the width, thickness, and length of its pedicle.

(d) *Sensitiveness*.—With the exception that a moderate degree of tenderness may be felt over the tumour just before and during a period, a healthy myoma is quite insensitive to palpation; but when infected, malignant, or adherent, myomata may become acutely tender and painful.

II. Topographical Anatomy.—As the physical diagnosis of myomata is so entirely dependent upon the anatomical features and developmental peculiarities of these growths, a certain amount of repetition is here necessary in order to save the reader from the tedious task of making frequent cross-references to the section on anatomy.

It has been stated that myomata are multiple in their arrangement, but only a limited number of the growths proceed to anything like palpable dimensions. It is frequently found that one tumour preponderates in size, whilst smaller growths are grouped around it, sometimes even in the same capsule; or they may arise from other parts of the parent uterus and form a conglomeration of tumours, for which Cullen has used the term a 'potato-bed.' Such a mass of tumours, some pedunculated, some sessile, may conceal the body of the uterus and upset the relations of the attachment of tubes, ovaries, and round ligaments. As a totally different picture may be seen a single myoma causing symmetrical enlargement of the uterus, just as it occurs in pregnancy. Between the conglomerate 'potato-bed' on the one hand, and the *grosesse fibreuse* of Guyon on the other, there will be physical variations so numerous as to defy description. The difficulty of dealing satisfactorily with the physical features of myomata may be met by dividing these tumours for diagnostic purposes into small, medium-sized, and large fibroids. Another plan, which will here be followed, is to adhere to the topographical division of myomata while discussing points of diagnosis.

Corporeal Myomata. 1. Subserous Myomata.—As already stated, these tumours may be large or small, sessile or pedunculated, and may possess but a very thin capsule of uterine muscle. The small variety is felt on palpation as a knob or localized irregularity on the surface of the uterine wall. Many such may be felt in one and the same uterus by bi-manual palpation. The large subserous growths are felt as independent tumours, *i.e.* the body of the uterus may be distinguished as such apart from the growth; the mobility of the latter will vary with the width of its attachment to the body of the uterus. When solitary and small, they may be mistaken for the anteflexed or retroflexed body of the uterus, but their hard

consistence and the proper location of the fundus will serve as determining factors. With a broad connection, the tumour will only have the range of movement afforded by the uterus itself; with a stalked attachment, it may be moved from side to side with ease, until such time as free movement is prevented by increased size of the growth, or by the acquiring of adhesions.

The thickness of the pedicle varies in some degree with the size of the tumour—the larger the growth, the longer and narrower, as a rule, is its pedicle. In the presence of a pedunculated myoma, the uterus may retain its shape up to the point from which the pedicle arises; sometimes it may be elongated and thickened by muscular hypertrophy; the length of its cavity as determined with the sound is not notably increased. With very easily movable subserous myomata ascites may occur.

The smaller the connection of the tumour with the uterus, the more difficult becomes the diagnosis of a uterine myoma—indeed the uterus and the tumour may feel as if totally independent of one another, since the pedicle is very difficult, if not impossible, to palpate; with a wide pedicle it is possible to appreciate its fleshy consistence, and at times its breadth can be estimated. The hard consistence of a subserous tumour will sometimes enable its outline to be defined from that of the body of the uterus, the latter being much softer. Since subserous tumours lie in the abdominal cavity, they may attain to an enormous size; and when pedunculated, they have to be diagnosed from solid ovarian tumours, and if cystic, from fluid ones. Confusion is very likely to arise when a uterus is rendered irregular by myomatous nodules and is accompanied by an ovarian fibroma with a long pedicle; the *nebentumor* is quite likely to be considered as uterine also. The converse holds equally good; since a subserous myoma may be just as freely movable as an ovarian tumour, it may easily be mistaken for such, especially if ascites happens to be present. If the uterus can be demonstrated as normal in size and free from myomata, a solid pelvic tumour with ascites is most likely to prove to be ovarian.

Although pedunculated myomata frequently lie in the abdomen and may attain a large size, they not infrequently lie in the pelvis and can easily be removed through the pouch of Douglas by vaginal myomectomy. Figure 133, p. 297, shows a specimen which I removed in this way. Reference has already been made to the tendency of these growths to acquire a vicarious extra-uterine blood-supply, *i.e.* to become cut off from the original source of nutrition and to be henceforth parasitic. This condition is naturally associated with loss of previous mobility, and also with the development of ascitic fluid in some cases; the difficulties in diagnosis are then much increased, and if, as in a case recorded by Cullen, the ascites be extreme (51,000 cc.), the clinical signs will favour the diagnosis of an

ovarian tumour, or the sign of ballottement caused by a solid tumour in free fluid may suggest pregnancy.¹

Subserous myomata may render diagnosis difficult or impossible by becoming

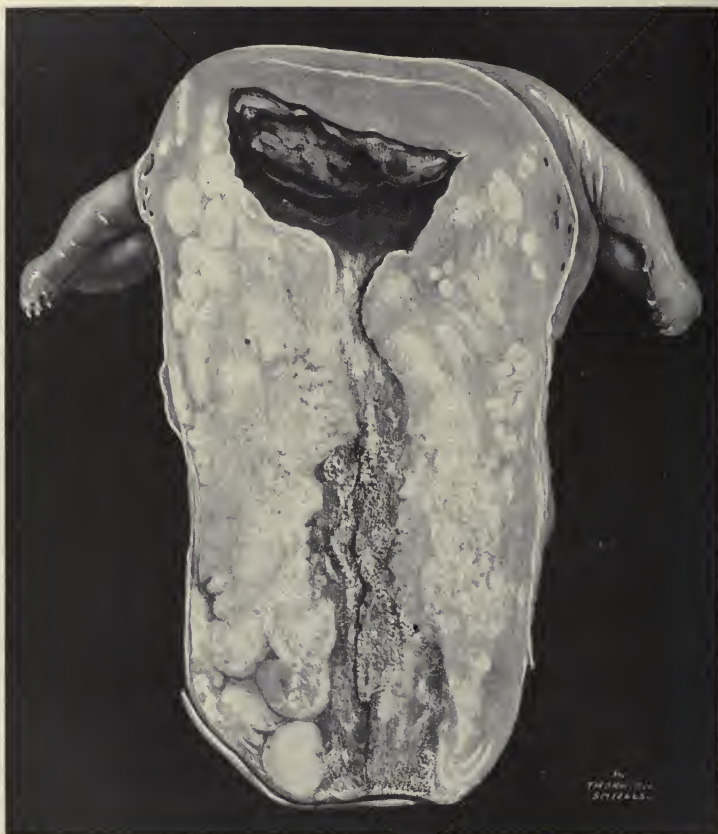


FIG. 121.—Showing generalized carcinoma of the uterus, which was diagnosed as myoma.

infected. Cases are related, where abscesses in subserous growths have established fistulous communications with the bowels; and although intestinal obstruction is rare with myomata, kinking of the bowel adherent to a subserous growth has led to intestinal distension, faecal vomiting, and death.²

2. Interstitial Myomata.—A solitary interstitial growth is generally easy to

¹ Kelly-Cullen, "Myomata of the Uterus," Case P.C.H.I., page 35, figure 25.

² Kelly-Cullen, *l.s.c. Gynaecological*, series No. 12,216, pp. 135, 435, 447, 677.

recognize as a uniform smooth projection of one wall of the uterus, with the opposite wall stretched out over the swelling in crescentic fashion, the whole forming a spherical mass which comprises the uterus and tumour together. Such tumours tend to become more and more submucous; only by the use of a sound can the degree of encroachment on, and alteration of, the cavity be estimated. When they arise in the posterior wall of the cervix, they present special clinical features which will be described under "Cervical Myomata."

A solitary interstitial myoma has to be differentiated from sarcoma arising primarily in the body of the uterus; also from adenomyoma, and even from carcinoma of the body and from chorionepithelioma. In many cases the differential diagnosis is impossible, more especially when some degenerative or infective process implicates the tumour. Interstitial myomata have been suspected in cases of vesicular mole, in which localized contraction of the uterine wall had produced irregularities which were mistaken for myomatous masses. In a case of this kind the clinician was mystified to find the position of the lumps vary, and the diagnosis was finally established only on opening the abdomen. Chorionepithelioma has been diagnosed as a solitary interstitial myoma.

Figures 121 and 122 show a condition which may not inaptly be described as a general *carcinomatosis* of the body and neck of the womb. When I removed the uterus, I thought it was the seat of a solitary interstitial myoma becoming submucous, and it was not until section was made that the real nature and particular interest of the specimen became apparent. The accompanying haematometra caused more enlargement of the body than appears in the drawing of the hardened uterus.

Sarcoma of the body has been mistaken for a solitary uniform interstitial myoma again and again, although the error usually arises in diagnosis between the submucous variety and a malignant growth, to which further reference will be made. This difficulty, as stated before, is more particularly met with when the myoma becomes degenerate and is the seat of pain and tenderness.

Large interstitial myomata which have become cystic are very often mistaken for ovarian cysts, and this statement also applies to these growths when they are rendered oedematous by impaction, or before they have become actually cystic. A case of my own illustrates this point, viz. Figure 123, which shows the cavity of the uterus opened up and a style passes through a square hole (cut in the posterior wall) into a large cystic space which contained fluid resembling blood.

The diagnosis of a single interstitial myoma of the body of the uterus may be extremely easy, its presence being demonstrable as a globular mass which is continuous with, and moves with, the cervix, as felt *per vaginam* and *per rectum*; whilst

per rectum the sacro-uterine ligaments are felt to be in relation to the tumour, both ovaries can be felt at the sides, while with a relaxed abdominal wall, the round ligaments can be palpated as well; they will pass obliquely upwards and inwards to the front wall of the growth. In spite of these anatomical facts the difficulties



FIG. 122.—Showing the posterior view of the cancerous uterus seen in Fig. 121.

in forming a correct opinion may be so great that only an estimation of the probabilities can be arrived at.

Too much stress cannot be laid on the importance of obtaining an accurate history of the case; *e.g.* the irregular haemorrhage with carcinoma is a help to diagnosis, but when in doubt, exploration of the uterine cavity will settle the question.

In large interstitial growths examination under anaesthesia may be necessary

for diagnosis ; the cervix should be seized and drawn down whilst an examination *per rectum* is made, and the assistant may draw up the growth *per abdomen*, and so make traction on the cervix. If on bi-manual examination the surgeon pushes *down* the abdominal mass whilst testing its relation to the cervix, he may be misled by the results of his investigation. A solid ovarian growth superimposed on the uterus will, when depressed by manipulation, communicate mobility to the cervix ;

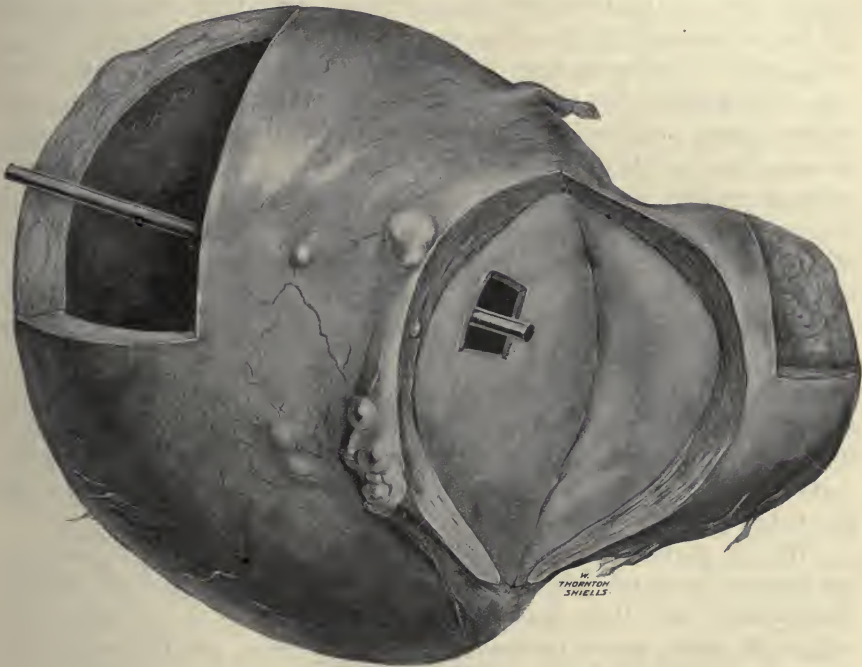


FIG. 123.—Showing large cystic myoma filled with bloody fluid. It was diagnosed as an ovarian cyst.

whilst *upward* traction on the cervix is much more apparent when a myoma is drawn up than when a fibroma of the ovary is similarly treated.

The sound will show a displacement of the cavity forwards, backwards, or to one or other side, together with enlargement or elongation in cases of single interstitial myomata. The shape of the uterus in single myomata often corresponds to that of the gravid uterus ; this applies to interstitial growths, but more especially to those which invade the cavity and become submucous. When multiple and numerous, the diagnosis of interstitial myomata is easier. The uterus is

irregular in shape, and the sites of origin of the growths can be made out by palpation.

3. Submucous Myomata.—The physical diagnosis of a submucous from an interstitial growth is impossible in many cases, especially where the cervix is closed.

The uniform rounded shape of the uterus which passes gradually or abruptly into the portio vaginalis is in favour of the growth being already submucous—in fact the more close the resemblance to the pregnant organ, the more likely is it that the tumour lies mainly in the uterine cavity; but absolute proof that this is so, is only possible by palpation when the cervical canal is opened up, and the lower pole of the growth is felt by the examining finger. This sign is most likely to be obtained during menstruation, and, in point of fact, the true situation of the tumour is more often accurately determined by the symptoms than by the physical signs which are revealed by palpation. A very characteristic symptom already noted is the expulsive pains which are associated with submucous growths. These painful uterine contractions, occurring during the menstrual flow, cause an enlargement of the tumour by congestion, and also a dilatation of the cervix; when menstruation is over, the congestion of the growth subsides, it recedes again into the uterine cavity, and the os closes.

So long as a submucous myoma remains in the uterine cavity, the diagnosis is mainly to be made from the symptoms—menorrhagia and dysmenorrhoea. When it has been driven down into the cervical canal, the entire cervix and the portio vaginalis are expanded to form a rounded investment to the extruding pole of the growth (see Fig. 93, p. 201).

When a uterus is enlarged, but of normal shape, with the cervix unaltered, the diagnosis has to be made between a submucous myoma and a gravid uterus of corresponding size. Here again the symptoms are often the best guide. The history of regular severe hæmorrhages with a myoma, and the cessation of menstruation during pregnancy, will decide the matter in some cases, but irregular bleeding in pregnancy may be mistaken for true menstruation. Hegar's sign, the flail-like attachment of the body to the neck of the womb in the early months of pregnancy, is helpful, as is also the softening of the cervix and the drawing up of the latter with apparent shortening. Blue discoloration of the vaginal mucous membrane is sometimes observed in the subjects of myomata, but is never so marked as it is during pregnancy. Activity of the breasts will favour the exclusion of a submucous myoma, for although a constant sign of pregnancy, mammary secretion is very rare with myomata. Great difficulty in diagnosis can occur when the foetus is dead, so that in doubtful cases, signs of life should be waited for; soft

myomata may have a consistency resembling that of pregnancy, whilst pregnancy with a dead foetus *in utero* may appear as a hard tumour and cause frequent haemorrhages. The sound must not be used in these cases, the diagnosis must remain open, and repeated investigations should be made.

Submucous myomata vary exceedingly in size; the smallest are often no larger than a cherry, or a pigeon's egg, whilst the largest may give rise to a tumour, the upper pole of which extends to the umbilicus, with its lower extremity reaching far below the dilated os (see Fig. 93, p. 201), and even projecting through the vulva.

The diagnosis of *small* sessile submucous growths is mainly symptomatic. Before the cervix is dilated, the presence of such growths is conjectural. Profuse and prolonged menstruation is, as a rule, the first sign of a submucous nodule; the excessive bleeding may develop gradually or may be severe from the first. In some instances the loss of blood is very alarming; it is bright red at the onset and later becomes dark and brownish. Large clots resembling pieces of liver may be passed. As these growths are most frequent during the child-bearing period of life, the question of pregnancy with abortion has to be considered. The so-called 'cervical abortion' in which the dislodged ovum lies in an expanded cervix above a closed external os, whilst the empty uterus is felt above, presents a picture very like that which may be seen in a non-parous subject whose uterus is in process of expelling a submucous myoma, with the os not yet opened up. Even when the intra-uterine tumour can be felt through a partially dilated cervix, the differentiation between a myoma and an intact ovum is by no means always obvious.

Since the presence of a small submucous growth does not alter the shape of the uterus, the signs and symptoms to which it gives rise may correspond with those of chronic metritis, and an exploration of the cavity of the uterus may be necessary before the diagnosis can be settled (see Fig. 71, p. 146).

When the external os is sufficiently dilated to enable a polypus to be seen as well as felt, the diagnosis is simpler. An ovum is generally of blackish hue from infiltration with blood, whilst a polypus which has not yet been extruded and is not gangrenous, has the colour of the normal endometrium; but this colour-test by inspection may fail. As an example, the reader is referred to Figure B, Plate XI., in which the lower pole of a submucous myoma is seen to be deeply injected. On palpation the ovum will be found to have a softer consistence; it is friable, and is easily dislodged from the uterine wall, whereas the myoma has a smooth surface, a hard consistence, and a firm attachment to the uterus.

To differentiate between a molar pregnancy (missed abortion) and a necrotic submucous myoma may be difficult.

The importance in diagnosis of examining histologically all polypoid submucous growths cannot be over-estimated, since a polypus, apparently myomatous, may prove to be a myosarcoma. Symptoms, clinical signs, and age-incidence, are of little help in the differential diagnosis between submucous myoma and submucous myosarcoma. There is irregular haemorrhage and pain in each case; a blood-stained *watery* discharge is frequent with sarcoma; it is not infrequent with myomata, especially when the growth is commencing to necrose.

The age at which submucous growths are most frequent extends from about thirty to fifty years, and whilst sarcoma, on the average, is seen a little later, many cases occur before that period of life. A certain diagnosis can therefore only be made by *microscopic examination of a portion of the growth*.

In the section on "Infection of Myomata" (p. 232) reference was made to the peculiar liability of submucous growths to become septic; this is more particularly the case after the tumour has opened up the external os and occupies a portion of the vaginal canal. In such a position, inspection and palpation are comparatively easy, and ought to lead to no error in diagnosis. The symptomatology is distinctive, and has already been described; the foul discharge may, before examination, arouse suspicions of a cancer of the cervix, but it is most exceptional for a proliferating carcinoma to be mistaken for a necrosing myoma, when proper examination is made.

Another diagnostic point of the utmost practical importance is the differentiation between an *inverted uterus* and a myomatous growth in the vagina. An inverted uterus being rare, and a myomatous polypus, the size of a partial inversion, being fairly common, the usual error is to mistake an inversion for a polypus. When operating for the removal of a large polypus, it should be made an invariable rule to ascertain first by abdominal, rectal, and vaginal examination, the presence of the fundus in the pelvis. With inversion, a funnel-shaped depression will take the place of the absent fundus, whilst *per vaginam* the upper limits of the ring of a partially inverted uterus may be made out either by the finger, or, if the cervix is too tightly embracing the intussuscepted body for the finger to pass, by the use of the sound; this will be checked at the upper limit of the inversion, but with a polypus it will pass deeply at one side or the other into the cavity of the uterus. It is said that the openings of the tubes can be defined and probed, but with a septic, rough, exposed endometrium this is not always possible. In fact all inspection-signs are deceptive, since an inverted body and a myomatous polypus may be the same size, possess the same colour, produce the same type of bleeding and the same type of foul discharge. The fact that a submucous polypoid myoma

can itself cause partial or complete inversion, when it arises from the fundus uteri, must not be overlooked (see Fig. 95, p. 203).

Submucous myomata which do not become extruded, though less liable to infection than those which in part occupy the vagina, are nevertheless not infrequently the seat of sepsis. Whether sessile or pedunculated, they enlarge the cavity of the uterus, and tend to establish and keep up a patulous state of the cervical canal, even when they do not act as a mechanical dilator. *True* endometritis is therefore not an infrequent accompaniment of these growths.

The passage of a sound without antiseptic precautions was in former days a source of infection of these growths: the instrument not only carried in pathogenic and saprophytic germs, but caused abrasion of the protecting endometrial covering, with the result that the injured tumour rapidly sloughed. Even though every aseptic precaution is taken, the passage of a sound is dangerous owing to its liability to cause injury to the mucous membrane which invests the tumour, and it has been frequently shown clinically that these intra-uterine submucous growths are particularly intolerant of such injuries as an aseptic sound can produce; subsequent necrosis and infection of the dead mass being generally the ultimate result. If a diagnosis cannot be made without the passage of a sound, it is better to defer its use until the patient is on the operating table under an anaesthetic, when, if the sound discovers such a growth, myomectomy may be carried out forthwith.

Another source of infection of intra-uterine submucous myomata is puerperal sepsis, to which the presence of a necrosing tumour is a predisposing cause. Although the tumour is not *ab initio* the site of the infection, its liability to fatty necrosis (with haemolysis) is so marked that no better nidus could be provided for ascending organisms. Pregnancy is frequently interrupted in the earlier months, when tumours of this kind are present, and puerperal fever results. The diagnosis in these cases is made by feeling the growth through the patulous cervix, when it may present a sufficiently characteristic rounded shape and firm consistence to distinguish it from a piece of ragged friable placenta. The treatment of the infective process entails the removal of the growth.

When a large submucous intra-uterine myoma becomes cystic, it is easy to make the mistaken diagnosis of pregnancy of a date corresponding to the size of the tumour. In the case of which Figure 102, p. 217, shows the specimen, this error was made.

Sometimes these large tumours are attacked by organisms at their exposed lower pole; this means that the protecting cap of mucous membrane has been abraded or punctured. When this happens, the most rapid and nauseating putrefaction is

liable to occur ; the rapidity of the process is easily understood when it is remembered that these submucous tumours attain a size reaching up to the umbilical level as much (or more) by cystic formation or oedema, as by actual physiological new formation. The sodden hyaline tissue is the best possible culture-medium for the invading saprophytes, and these are not long in setting up a fulminating putrescence in the whole growth with severe septic intoxication of the patient.

The diagnosis of a sloughing intra-uterine myoma is sometimes self-evident, especially if, as in a recent case of mine in the Charing Cross Hospital, livid greenish-purple tags of stringy tissue, 4 inches in length, hang outside the vulva. In this case the fundus uteri reached as high as the navel, and the patient was extremely cachectic and febrile.

The diagnosis is less certain with sloughing intra-uterine myomata of smaller size. The smaller size of the uterus may cause the offensive discharge to be put down to infection of an adeno-carcinoma of the body, or the history of a miscarriage and irregular haemorrhages preceding may lead to the possibility of chorionepithelioma being considered ; pyometra from stenosis—if the patient has passed the menopause—has to be entertained as a possibility. So that for definite diagnosis of a medium-sized sloughing myoma, exploratory dilatation becomes necessary in certain cases.

4. Retroperitoneal and Intraligamentary Myomata ('Burrowing Fibroids').—It has been shown that in the differential diagnosis of subserous, interstitial, and submucous myomata the question of the presence of pregnancy, either intra- or extra-uterine, has to be decided. Retroperitoneal and intraligamentary growths are no exception to this rule.

If a retroperitoneal growth arises from the back of the uterus, it will push that organ forwards, and by burrowing into the recto-vaginal septum, and by steady growth, will push the cervix up behind the symphysis and give rise to general displacement, which, when the growth is softened, gives the physical picture of a diffuse retro-uterine haematocoele or of a retroverted gravid uterus. The anatomical fact that the myoma has elevated the peritoneum, whilst the ectopic blood-clot has depressed that structure, cannot of course be appreciated clinically ; but the fact that the posterior fornix is in each case depressed, and that the posterior half of the pelvis is occupied by a fixed mass, which pushes the body and cervix of the uterus upwards and forwards, makes differentiation by vaginal examination very uncertain. The most careful and painstaking judgment, based on all available data, is necessary for accurate diagnosis. The same applies to diagnosis between a myoma in the broad ligament and the rare condition of intraligamentary haematoma, which arises from a secondary implantation of a gestation between the folds of the broad ligament,

after a gravid tube has ruptured on its under aspect between the layers of its mesosalpinx. With each condition the uterus is laterally displaced by a fixed mass which occupies one half of the pelvis; if the 'haematoma' is mainly blood-clot, it nevertheless may become surprisingly hard and tense. If the foetus is alive with a quick placenta, neither foetus nor after-birth can usually be felt as such, and the clinical history will have to be relied upon in estimating the probabilities of the case.

Less doubt will arise over a myoma arising beneath the utero-vesical pouch, until such a growth spreads out laterally into the broad ligament, when it calls for a further description, to be discussed later; but small localized growths arising

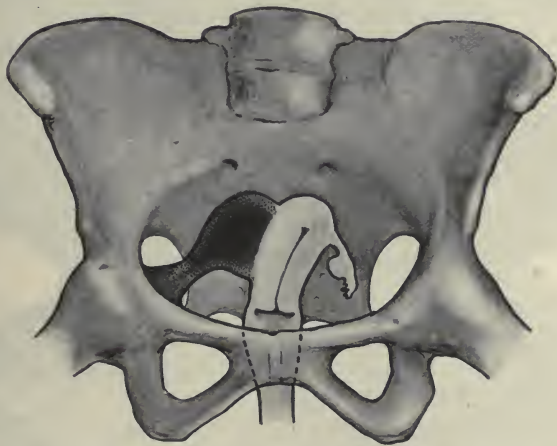


FIG. 124.—Showing nodular parametritis which may be diagnosed as an intraligamentary myoma. (After Winter.)

anteriorly from above the supravaginal cervix are easily diagnosed on bi-manual palpation through the anterior fornix. Those which spring from the cervix itself will be mentioned later on.

Anterior retroperitoneal growths will cause the uterus itself to become retroposed in the same way that some parovarian cysts will do. The tense elastic consistence of the latter, in contrast to the hardness of a myoma, affords the physical evidence upon which a diagnosis between the two conditions must be made.

Winter and Ruge¹ draw attention to the necessity of diagnosing, in certain cases, between an intraligamentary myoma and a parametritic exudation. They say it occasionally happens that, during absorption of the cellulitis, the outer part of the exudation which is in contact with the pelvic wall is the first to disappear, and the

¹ *Lehrbuch der gynäkologischen Diagnostik.*

mass contracts towards the uterus, when it will appear as a rounded tumour attached to the womb, and resembles a myoma. The diagram (Fig. 124), modified from



FIG. 125.—Showing a true cervical myoma opened up from the front.

Winter, illustrates what is meant. Rectal examination is the most helpful guide in distinguishing between a parametritic exudation and an intraligamentary myoma. As a rule, an exudation widens out fan-shaped towards the pelvic wall, in contrast

to the rounded contour of a myoma, and the absence of fixation of the latter to the wall of the pelvis may be discovered by rectal examination. When the two conditions are associated, the diagnosis is very difficult.

The difficulty of differentiating between a fixed intraligamentary myoma and a large adherent pyosalpinx is often extreme: the latter may become as rounded as a myoma; it may elevate the broad ligament, so that this structure comes to form a hood over its anterior and upper aspects, with the round ligament running across it, in exactly the same way as it does over a swelling within the folds of the ligamentum latum. The dense thick walls of a large pyosalpinx and the accompanying cellulitis will give a firm consistence which is very misleading; in the same way a soft myoma may give a false sense of fluctuation.

An inflamed tubo-ovarian mass, the outcome of salpingitis purulenta, which has not become a pyosalpinx but has set up diffuse cellulitis of cartilaginous hardness, is liable to be mistaken for an infected myoma, on account of the wide attachments to the uterus and the density of the inflamed tissues.

Mention has already been made of the mistakes which may arise in differentiating between ovarian fibromata and solid uterine growths, and although there is no great difficulty, as a rule, in forming an opinion as to the existence of an ovarian cyst, it is not infrequently found that the 'cyst' is a soft myoma of the uterus. Finally, since peri- and para-tubal haematocoeles form solid, firm, rounded tumours, myomata of small size must be excluded in the diagnosis of these structures.

5. Cervical Myomata.—(a) *Interstitial.*—True cervical myomata are comparatively rare. Their clinical peculiarities are as follows:

(1) The tumour arises in the wall of the neck of the uterus, and forms a uniform egg-shaped tumour.

(2) Its seat of election is the posterior cervical wall.

(3) It causes a widening and elongation of the cervix, so that the cervical canal may come to measure as much as 5 or 6 inches in length.

(4) Starting as an interstitial growth, it becomes submucous, and tends to open up the external os to a variable degree.

(5) The cervical canal is not only elongated but laterally expanded (Figs. 125 and 126).

(6) The external os is altered in shape, forming a crescent or half-moon, or it may become opened up completely by the lower submucous pole of the growth.

(7) The axis of the uterus is frequently altered, so that the os is felt tucked away, high up under the symphysis or in one or other fornix.

(8) The fundus is felt well up in the abdomen, perched on the top of a globular

mass, like an adrenal on a kidney ; very often it can be moved upon the fixed pelvic tumour, and the unsuspecting may regard it as a subserous myoma, but in point of fact this relation forms a striking diagnostic feature of a large cervical myoma.

Under exceptional circumstances a true cervical myoma has been observed to



FIG. 126.—Showing a true cervical myoma, with the uterus opened from the front.

dilate the cervix so completely as to obliterate the vaginal fornices entirely ; it then becomes impossible to tell where the cervix ends and the vagina begins ; the submucous portion of the tumour lies in the vagina, like the head of the foetus in the second stage of labour.

It is most exceptional for large cervical myomata to present any irregularities on their surface ; they are generally found to be free from secondary myomatous

outgrowths, and have the uniform outline and size of a swan's egg or a coco-nut. Figure 96, p. 204, shows an exception to this rule.

(b) *Submucous*.—These tumours, when they attain any considerable size, are necessarily covered to a more or less extent by the mucous membrane of the canal



FIG. 127.



FIG. 128.



FIG. 129.

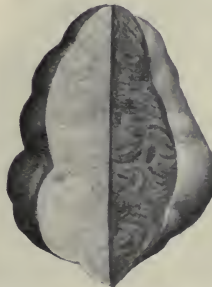


FIG. 130.

FIGS. 127, 128, 129, 130.—Showing submucous pedunculated myomata of average dimensions. Figs. 129 and 130 are corporeal polypi.

of the cervix, and in this sense are *partially* submucous; but they differ entirely in their clinical features from *true* submucous myomata of the cervix. These latter acquire a pedicle very early, and appear as myomatous polypi at the external os uteri. The length of the stalk will vary with the site of attachment; if arising, as is not uncommon, from the upper part of the supravaginal cervix, the stalk elongates until the growth hangs in the vagina, where it may be discovered

in a more or less necrotic state. It is more than probable that polypi which are apparently cervical sprang originally from the cavity of the uterus, and that during extrusion the final attachment is that of a pedicle at, or below, the internal os.



FIG. 131.—Showing a pedunculated cervical myoma lying in the vagina.

(From Eden and Lockyer's *Gynaecology for Students and Practitioners*.)

As a rule, submucous cervical myomata do not attain a large size, and Figures 127 and 128 represent the average dimensions, the drawings being made from the actual tumours after removal.

The diagnosis of submucous growths of the cervix is generally easy, since they can be readily felt. Their extrusion is accompanied by painful uterine contractions during menstruation, and the blood-flow is increased in amount and also prolonged; septic symptoms in the nature of a foul discharge may follow, also strangulation and necrosis. The uterus itself is generally enlarged, either by endometritis and 'work-hypertrophy' (see Fig. 131), or, in addition, by the presence of other myomata.

(c) *Subserous* cervical myomata in the strict sense of the term do not exist, since the cervix is situated at a distance from the peritoneum, but outgrowths from the cervix into the cellular tissues occur (see Fig. 96, p. 204), and these are the analogues of the corporeal subserous myomata.

Clinically speaking, the *interstitial* myomata of the supravaginal cervix

are the most important. The vaginal portion of the cervix is very rarely the seat of myomata; a submucous growth may slide down the canal until its pedicle is attached to the 'portio,' and more rarely interstitial tumours of small size may be felt in one or other lip. Such a growth is to be recognized by its solid

consistence and rounded shape, whilst the surface over it is quite healthy; it is not likely to be mistaken for an intra-cervical carcinoma, and it is not so elastic as a tense retention-cyst; moreover, its tendency is to form a prominence on the side rather than on the extremity of the 'portio.'

III. The Diagnosis of Secondary Changes in Myomata.—The fate of myomata, as we have seen, is very variable, owing to multiple changes which are prone to occur in large and small growths alike. Although it is impossible to diagnose the nature of these changes from a survey of the clinical data, nevertheless there is no great difficulty in differentiating an uncomplicated myoma from one which is undergoing degeneration or malignancy. In the first place, an uncomplicated tumour may be devoid of symptoms altogether, and it may remain symptomless whilst undergoing hyaline, fatty, and calcareous change; but if fatty necrosis is accompanied by haemolysis (red degeneration), the tumour is wont to become harder and to cause pain and tenderness with, in some cases, a rise of temperature. It is reasonable to assume that in necrosis, whether red, yellow, or of any other colour, the rise of temperature (which accompanies local pain and tenderness) is due to the absorption of blood-pigments. It has been suggested that the necrotic tissue itself produces a low form of chemical toxæmia, but this has not been proved; whereas the blood-ferments are known to possess an influence on the heat-regulating centres. At any rate a variable degree of thrombosis is the usual accompaniment of necrosis, and blood-extravasations are also not uncommon. Again, when a cystic myoma causes a rise of temperature, it is discovered that the fluid in the cyst is discoloured from an admixture of blood-pigment. The clinical phenomena of tenderness and pain are probably referable to tension in the capsule of the growth, since a more or less rapid increase in the size of the myoma is one of the signs of degeneration, and also of sarcomatous transformation. When a necrotic myoma becomes *infected*, the symptoms are much more pronounced, due no doubt to the effect of absorption of toxins produced by the septic germs; what happens in such a case has already been described.

The differentiation between sarcoma and degeneration cannot be made clinically.

THE TREATMENT OF UTERINE MYOMATA

Myomata of the uterus make up about 10 per cent of all gynaecological cases, and it is certain that a number of myomata remain undiscovered from the fact that the subjects of the tumours are in perfect health, and have no need to consult a surgeon. Hence it may be stated that the majority of myomatous uteri require

no treatment whatever, and it is often best, in certain cases, to keep a patient in ignorance of the fact that such a tumour exists.

Should a myoma be discovered by routine examination, its size and position should be carefully noted, and the patient advised to return for further examination at certain intervals, so that the behaviour of the growth may be watched.

For symptomatic reasons a certain proportion of myomata (the percentage of which has not been worked out) do call for treatment, and this will be *palliative* or *operative* according to the nature of the case.

Palliative Treatment

Palliative treatment is directed towards effecting an alleviation of symptoms and attempting to reduce the size of the growth. The main symptom which calls for palliative treatment is haemorrhage, and to this may be added, as of secondary importance, the relief of minor pressure-symptoms.

Haemorrhage.—The value of drugs in checking the menorrhagia associated with myomata is the subject of a wide divergence of opinion among gynaecologists. The drug which has had the most extended trial as a uterine haemostatic is ergot of rye; the prevailing view as to its utility in cases of myomata is, that given *per os*, it is seldom of any use; to be successful it must be given in full doses by the hypodermic method. Haultain recommends the solution formerly used by Simpson, namely, R̄. Ergotin ʒii, Chloral Hydrat. ʒiv, Aq. dest. ʒvi. Twelve drops contain three grains of ergotin, which is an ordinary dose. This amount is injected deeply into the muscles of the buttock, since, if only introduced into the subcutaneous cellular tissue, it is liable to cause abscess-formation.

Another prescription recommended by E. Opitz is: R̄. Ergotin 4 grains, Acid Carbol. liq. 2 minims, Aq. 20 minims, to be given by an intramuscular injection once or twice every second day up to sixty injections. Opitz remarks that it is painful, and therefore disliked by patients. He recommends the administration by mouth of 15 to 20 minims of the liquid extract of hydrastis, or .005 gramme of stypticin (cotarnin hydrochloride), either drug to be given two or three times daily for eight days before a period, with the object of exciting uterine contractions; but he does not find the size of the growth is decreased to any marked extent by these drugs. "Lodal," another cotarnin preparation, given in $\frac{3}{4}$ -1½ grain doses, is considered by some authorities to be of value, but I have been disappointed with its use.

Opitz states that interstitial growths are influenced by drugs, but that subserous tumours are not, whilst submucous myomata are driven farther down by

their use ; in other words, he is convinced of the ability of drugs to excite uterine contractions powerful enough to exert a definite influence on myomatous growths. Preparations of ergot, of hydrastis, and the oxidized products of narcein, are the drugs mainly in use at the present day. Mercury and iodides which were commonly employed twenty years ago are now completely discarded. Some drugs are thought to have the direct effect of promoting absorption of the tumour—calcium chloride has been given the credit of doing so, and Haultain states that “sodium chloride mineral waters have an undoubted effect in this direction.” It is more probable that any good effects which the salts of calcium may produce, are exerted through their action as a general haemostatic ; it is well known that the chloride and lactate of calcium, when taken in considerable doses and for a prolonged period, increase the coagulability of the blood, and thus favour the arrest of bleeding by thrombosis. On these grounds calcium lactate in ten-grain doses, three times a day, may be given during the menstrual periods for a considerable time. The vaso-constricting action of adrenalin has been made use of both by applying the extract locally, and by giving it by the mouth.

It is also now well known that pituitary extract exerts a general effect on the circulation similar to that of adrenalin, and in addition, this substance produces well-marked uterine contractions, so that its uses in cases of menorrhagia may prove to be considerable. It should be administered by deep intramuscular injection in doses of 1 c.c. of a 20 per cent solution. Thyroid extract has not been found to be of any use in haemorrhage associated with myomata.

Hot Douching.—*Douching the vagina* with hot water at a temperature of 115° F. is used as a means of checking haemorrhage ; it has the advantage of doing no harm, if only weak solutions of antiseptics are used and the patient is kept in bed ; indeed, when menorrhagia is the only symptom caused by a myoma, rest in bed during the monthly period is sometimes alone sufficient to reduce the flow to limits within which it will do no harm. *Intra-uterine douching* with water at 110° F. has been recommended by Scotch authorities. The object of douching, whether vaginal or uterine, is to stimulate contraction.

Plugging.—Plugging the vaginal canal is a very efficient temporary means of controlling bleeding in cases of haemorrhage from myomata ; it should be done thoroughly, after a douche has been given. The patient should be placed in the Sims position, the perineum drawn well back, and the introitus vaginae opened up ; strips of sterile gauze impregnated with subgallate of bismuth are then passed up into the posterior fornix, which is tightly filled, and then the lateral and anterior fornices are tightly packed in the same way, whilst the lower part of the vagina

is only loosely filled so as to avoid unnecessary compression of the urethra. A ligature should be tied to the end of the plug or plugs, and the latter are then placed well inside the vagina, with the ligature left hanging outside. The gauze can be left in with perfect safety for forty-eight hours, and on its removal a douche should be given. If, as in rare instances may be the case, the cervical canal is patent enough to allow the passing of gauze into the uterine cavity, this may be done, and it is then as well to soak the end of the strip in 1-1000 sterile solution of adrenalin.

Curetting.—Curetting has a very limited application, but with small growths it often effects a marked improvement so far as symptomatic haemorrhage and anaemia are concerned. With large tumours the canal is often so distorted as to render a complete clearance of the hyperplastic mucosa impossible, and with certain cervix-myomata it would be impossible to reach the corporeal endometrium at all. I have seen satisfactory results in cases of small interstitial myomata, and the procedure appeals to me as scientific, since the mucous membrane in cases of interstitial growths is often in a state of oedematous hypertrophy, and is, moreover, frequently the seat of polypoid or fungous endometritis and contains thick-walled blood-vessels. The cervix wherever possible should be dilated, until the finger can pass for digital exploration. A small submucous nodule may be felt and removed; it may prove to have been the main cause of the haemorrhage, and after its enucleation the latter may be permanently checked. Whenever a myomatous polypus is removed, curetting should be done, and whenever a curetting is performed, a small submucous growth should be sought for by digital examination. A flushing curette may be used, and the uterus should be swabbed out after curetting with a strong solution of iodine: the Samaritan Hospital preparation is:—R. Iodine resublimed 1, Iodide of Potassium 1, Rectified spirit 2, Distilled water 2 (=1·4 Iodine).¹ A narrow drain of bismuth gauze is left in the uterus for twenty-four hours.

There is one danger in the employment of curetting which must receive comment. When a large submucous growth is present, its integrity as a healthy tumour depends on the entirety of its capsule of mucous membrane; if this is scraped away down to muscle, the growth is liable to undergo necrosis, and runs great risk of infection. This is the one and only serious objection to curetting, and demonstrates the necessity of selecting the cases for this treatment with due care. This can only be done by giving an anaesthetic and dilating the cervix. If a submucous growth presents, it is better to remove it than to scrape its capsule.

The Electric Current.—The galvanic current was often used in former times

¹ The strong solution of iodine is thought to act as a mild escharotic and also as an efficient antiseptic in cases of chronic infection of the endometrium.

for the controlling of haemorrhage; it was found to produce permanent surface-changes in the endometrium which led to relief from haemorrhage in certain cases.

Apostoli's galvanic treatment and the use of the Faradic current have now ceased to be employed, and they are only mentioned for their historic interest. Another form of treatment by electric energy has come to the fore in the treatment of haemorrhage, in the form of the Röntgen rays, and this will be referred to in the section dealing with *Radio-therapy* (p. 292).

Treatment of Pain and Pressure Symptoms.—Minor discomforts, such as bearing down in walking or standing, and backache, with a general sense of pressure, can often be relieved, when the myomatous uterus is small and retroflexed, by the use of tampons or a Hodge pessary. With a larger uterus also, relief is obtained by pushing it up into the abdomen, if need be, under an anaesthetic, and by the subsequent use of a pessary. Such a procedure should be carried out without employing undue force, for fear of lacerating vessels in possible adhesions. If the tumour appears to be adherent, the attempt to raise it out of the pelvis should be abandoned.

Pain may be due to secondary changes in the tumour, such as inflammation, or to pressure upon the viscera or upon nerves; for such cases rest in bed and treatment at a Spa give the best results. *Spa treatment* consists in the administration of large quantities of mineral water, the taking of hot baths, and the giving of hot vaginal douches; this is generally combined with the use of electricity and massage. In England, Woodhall, and in Italy, Salzo Maggiore are suitable for cases of uterine myomata. *Dysuria* from pressure on the bladder, accompanied by frequent micturition, and rarer cases of *retention* and *incontinence*, are met with just before menstruation, and are no doubt sometimes due to enlargement consequent on temporary congestion of the tumour, and sometimes to the growth having taken up a position causing temporary embarrassment of the bladder. Such cases need the use of a catheter, and the elevation of the tumour, followed by vaginal plugging or the introduction of a pessary to prevent its return to the pelvic position. The success of pessary-treatment in these cases will depend upon the size of the tumour and the integrity of the perineum: with a large growth or a relaxed vaginal outlet, a pessary will prove useless.

Removal of the Uterine Appendages.—Lawson Tait was the first to employ this operation in the treatment of uterine myomata. His first salpingo-oöphorectomy was performed in 1872, at the time when hysterectomy was an exceedingly dangerous procedure. Tait's results, as quoted by Haultain, show that of the first 272 cases the

primary mortality was twelve, *i.e.* 4.4 per cent. Of fifty cases whose histories were traced for six years after the operation, in seventeen the tumour had entirely disappeared, in fourteen it had become so reduced in size as to be harmless, and forty-one of the fifty patients were in perfect health. Tait laid stress upon the removal of the Fallopian tube and mesosalpinx as well as the ovary, his view being that it was essential to cut off the nerve-supply as much as possible. Some of the failures with this operation have been attributed to the physical inability to remove the whole of the ovaries owing to the situation of the growth, and subsequent experience showed that for the soft growths, *i.e.* those undergoing some type of degenerative change, oöphorectomy was practically useless.

In spite of the fact that the mortality of the operation was lowered as time went by, the uncertainty as regards results has led to the abandonment of oöphorectomy for uterine myomata. Haultain states that the "absolute cures" amounted only to 10 per cent.

Radio-therapeutics.—As this subject will be considered in a special Article¹ I must confine myself to the tabulation of my own conclusions as to the use of radio-therapeutics in the treatment of myomata.

Summary.—1. Radio-therapy probably acts mainly by destroying the ovaries, but X-rays appear to have a direct influence on the cells of the myoma as evidenced by the coincident shrinkage under the treatment which, when it is achieved, is too rapid to be explained by inhibited ovarian activity alone.

2. Radium and mesothorium used alone are not so suitable as X-rays for cases of myomata, as no shrinkage of the growth can be expected.

3. X-rays combined with mesothorium appear to effect more rapid haemostasis than do X-rays when used alone.

4. The French cross-fire combined with the Freiburg intensive technique promises the best results: only by cross-fire can topographical difficulties be overcome.

5. The treatment is of no avail for submucous growths.

6. Radio-therapy should be employed only in cases where the diagnosis of myoma is absolutely certain and when the tumour is uncomplicated by adhesions, degeneration, and new growth.

7. The gynaecologist must decide the indications for treatment and watch clinical developments.

8. The contra-indications outweigh the indications for radio-therapy.

9. Owing to the destructive action of radio-therapy upon the ovaries, it should be employed only in subjects who are approaching, or who have passed, the menopause.

¹ See Vol. III. p. 833.

Operative Treatment

The steady reduction in mortality from the operations on myomata marks one of the most striking advances in modern surgery. Twenty-five years ago the primary mortality of hysterectomy was about 23 per cent, and the operation of salpingo-oöphorectomy was frequently resorted to for the checking of hæmorrhage and for reducing the size of the tumour. Hysterectomy for myomata has now established itself as one of the most satisfactory operations in surgery, and it will never be deposed (by radio-therapeutics) from the high position it has attained. The status of hysterectomy was not secured without a struggle: its advance into favour was extremely slow, and affords one of the best examples of the steady progress of antiseptic and aseptic surgery.

Among the causes which contributed to the initial high mortality may be mentioned:

1. The restricted indications and the crudeness of the pioneer operation.
2. The imperfect knowledge of the life-history of myomata.
3. Imperfect antisepsis and asepsis.

Causes 1 and 2 worked together, for the impression acted on not many years ago was, that myomata were innocent tumours which could be treated effectually by rest, drugs, and good feeding; consequently surgeons only ventured to remove the uterus because of some urgent necessity, in fact as an *indicatio vitalis*. For an account of the history of hysterectomy for myomata see Article on Hysterectomy.

My colleague, Mr. Bourne, has kindly provided me with the statistics relating to operations for myomata performed at the Samaritan Hospital, London, during the last three years. They read as follows:—

1911	Total operations 85: recovered 82, died 3; mortality=3·5 per cent.
1912	„ „ 95: „ 88, „ 7; „ =7·3 „
1913	„ „ 64: „ 64, „ 0; „ =0 „
Total mortality for the three years, 3·6 per cent; number of operators ten.	

Many operations formerly in vogue are now obsolete (see Fig. 132); at present there are employed the following operations:

A. Radical Vaginal Operations.—(1) The removal of small pedunculated myomata; (2) morcelllement and enucleation; (3) colpotomy and myomectomy; (4) vaginal hysterectomy with ligation or with forci-pressure.

B. Radical Abdominal Operations.—(1) Myomectomy; (2) supravaginal amputation; (3) total hysterectomy.

The last two operations should be combined with the conservation of at least one ovary wherever possible, or with the transplantation of ovarian tissue.

Indications for Operative Treatment.—The guiding principle must be *nil*

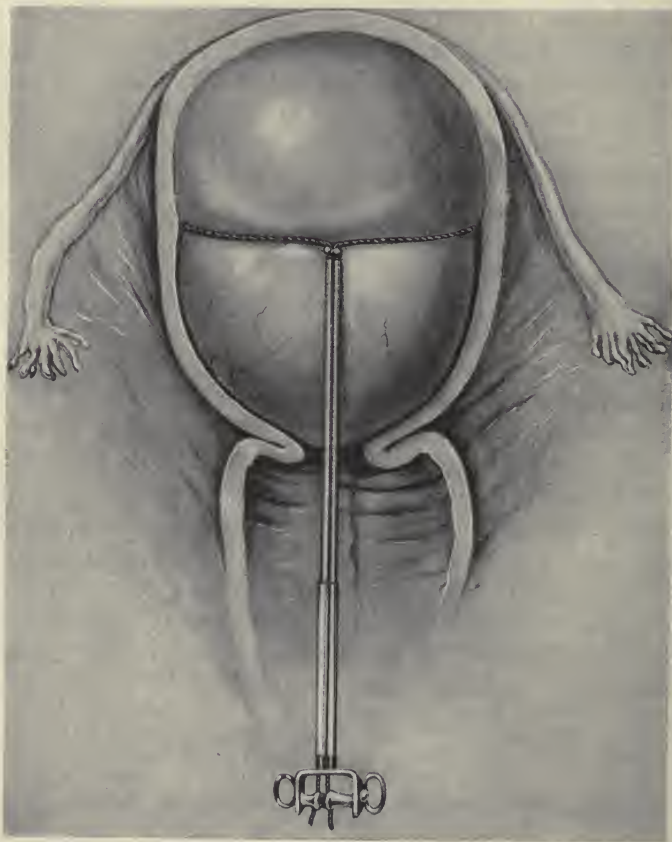


FIG. 132.—Showing the application of Gooch's cannula, now obsolete. The ligature, which was applied to the upper limit of the separated portion of the growth, was removed on the fifth day. Symptoms of blood-poisoning appearing, the tumour was then enucleated, with a successful result. (J. Hall Davis, *Trans. Obst. Soc.*, 1861, London, vol. ii.)

nocere. We must not employ a means of treatment that is more dangerous than the disease which we are called upon to treat. Therefore we ought not to operate upon every tumour we happen to discover. We must, however, remember that

5 per cent of myomata are associated with malignant disease, and we have a right to be influenced in our decision by the fact that the primary operative mortality has been reduced (for individual operators) to 2 per cent. *Definite Indications should in every Case be the Reason for Operation.*

In anaemic cases the percentage of haemoglobin should be raised to 50, the erythrocyte count should not be less than 3,000,000. Patients should not be allowed by their medical advisers to get into the deplorably anaemic state in which they are not infrequently sent to hospital. In view of the excellent results of hysterectomy, anaemic cases with a percentage of haemoglobin of 12, 15, 20 and so on ought to be unknown. There is no doubt that some women pick up remarkably quickly from severe loss of blood, but as soon as they are a little better another profuse period causes a set-back, so that the general state is one of chronic invalidism. A certain number of these cases are suitable for treatment by X-rays, but many are not. Submucous myomata, whether pedunculated or not, should be removed. Cervix myomata also call for extirpation. Myomata which cause pain, either from the fact that they are degenerate, malignant, or suppurating, or that they are complicated by inflammatory or neoplastic changes in the adnexa, are essentially operation cases. Myomata which have become adherent from conditions referable to the upper abdomen, such as appendicitis, adherent intestines, *et cetera*, are a source of danger and should be removed. Severe pressure-symptoms form another indication for radical operation. Retention of urine, intestinal obstruction, thrombosis of the large veins, and early renal disease are among the rarer indications for hysterectomy.

Contra-Indications to Hysterectomy.—The majority of myomata need no treatment, and therefore it would be most reprehensible to perform hysterectomy for a symptomless tumour. Grave degrees of anaemia are a contra-indication to a radical operation until the haemoglobin content has been raised (*vide supra*). Serious organic disease of other organs, such as advanced cardiac and renal disease, pulmonary phthisis, emphysema, and diabetes, contra-indicate a severe abdominal operation.

A general systematic examination should be made and the urine analysed before proceeding to hysterectomy.

A. Vaginal Operations.—1. *Morcellement.*—The absolute indication for this operation is the sloughing, gangrenous, submucous myoma. The putrefactive portions of the growth which occupy the vagina, and sometimes protrude outside the vulva, must be cut away with scissors; the upper intra-uterine part of the tumour often requires removal by first cutting up the growth piecemeal with

Second's instruments. Splitting of the cervix is sometimes necessary before a submucous sessile tumour can be enucleated, or before morcellement is possible.

I. have on a few occasions performed vaginal myomectomy by morcellement for large submucous tumours reaching up to the umbilicus, but have been disappointed as regards future fertility after this operation. The youngest case was that of an unmarried woman, aged twenty-two years and six months: a portion of the cystic tumour is figured on p. 217. In this case I removed a large cervix-myoma by panhysterectomy two years later.

In another case the tumour was very hard and the operation prolonged; but although the uterus was saved, it proved a useless organ as regards child-bearing.

2. *Posterior Colpotomy and Myomectomy.*—Following a correct diagnosis, for pedunculated subserous myoma lying in the pouch of Douglas as a solitary uterine tumour vaginal myomectomy is a very neat and commendable operation which I can recommend from personal experience (see Figs. 133 and 134). In such a case there is no need to open the abdomen.

3. *Vaginal Hysterectomy.*—Even the smaller myomata are now generally removed *per abdomen*, since the old objections raised against the upper route, based largely on the risk of incisional herniae and the intervention of peritonitis, are becoming more and more rare owing to improvement in technique, *i.e.* suture in layers, paramedian and oblique incisions,¹ asepsis, protecting of the wound-edges by rubber or tetra-cloths.

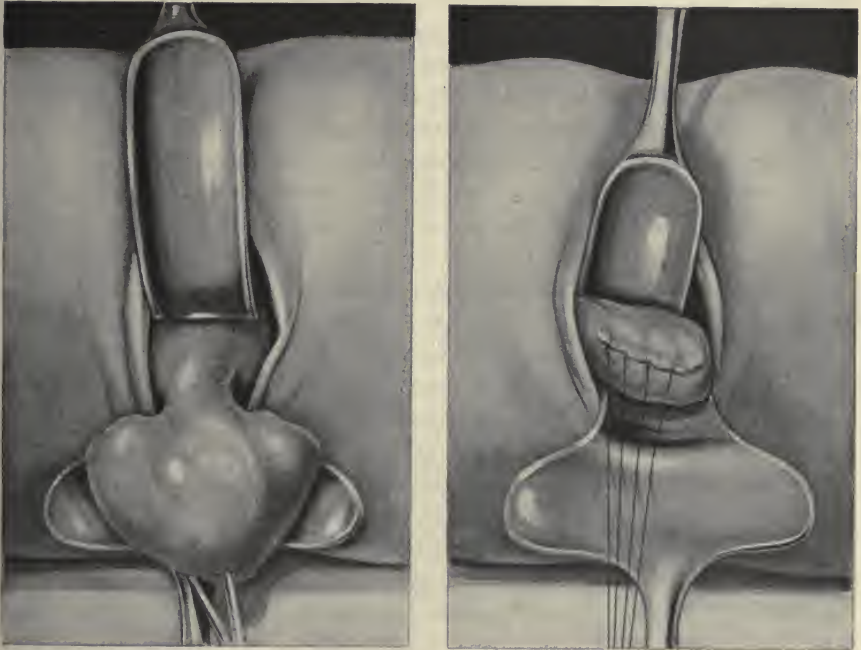
Nevertheless there are still some operators with a preference for the vaginal route, and I for one frequently employ it, largely from the stimulus received from the study of *Wertheim and Micolitsch's Vagino-peritoneal Operations*. And after performing about 100 vaginal hysterectomies without a death, my confidence in the operation has been assured.

B. **Abdominal Operations.**²—1. *Myomectomy.*—The retention of the uterus and the removal of the myoma would seem at first sight to be the ideal operation for these growths, but as a matter of practical experience this operation is found to have a limited field of utility. Myomata are very frequently multiple, and often subserous, interstitial, and submucous growths exist at one and the same time; and where several tumours are removed from the same uterus the latter is reduced to a useless organ, and, moreover, it may become the seat of subsequent growths. Only in cases where there are a very few growths present in the uterus is the operation

¹ Kustner Pfannenstiel.

² The technique of these operations is fully discussed in the Articles on Hysterectomy and Vaginal Coeliotomy (Vol. III. pp. 447 and 593).

of myomectomy applicable. It has also been sometimes noted that the uterus after myomectomy becomes sensitive if not actually painful. Engström, whom the writer visited in Helsingfors in 1913, stated that he had found myomectomy more dangerous than hysterectomy, the mortality being 5 per cent higher. Exception to the above remarks must, however, be taken in favour of removing *pedunculated* subserous growths in this way. The tying off of a pedicle and its oversewing is a very



FIGS. 133, 134.—Showing a pedunculated submucous myoma of the anterior uterine wall and its removal *per vaginam*. (Wertheim and Micolitsch (Lockyer).)

easy and rapid procedure, and the uterine body is sometimes scarcely influenced by these growths, so that when no other tumour exists, the removal of a fairly normal organ is not indicated, especially if the patient be advanced in years.

2. *Supravaginal Amputation*.—This is the operation which has raised hysterectomy to the zenith of its fame, and in this connection the name of Baer of Philadelphia, who showed the danger of constricting the neck of the uterus with ligatures, must never be forgotten. The results from this operation, in the hands of Kelly and Cullen, at the Johns Hopkins Hospital, Baltimore, from July 1, 1906,

to January 1, 1909, were : Cases 192 ; deaths 2, *i.e.* just over 1 per cent. The cause of death in one case was post-operative intestinal obstruction on the twenty-second day. The other case was one of a woman aged 44 years, with general peritoneal carcinoma as a complication of the myomatous uterus.¹

The majority of the operators are in favour of this operation. It is undoubtedly a *quicker* operation than total extirpation, largely because haemostasis is simpler and more easily attained, and there is less risk of infection from the vagina. Indeed it is perfectly obvious why this operation is more popular than panhysterectomy : it is the easier operation ; it only takes half an hour or less from start to finish when carried out by Kelly's method.

It is, moreover, claimed that the integrity of the vaginal vault is a matter of importance in married women, and that shortening of this passage is bound to occur if the portio vaginalis is removed ; but the latter statement is not correct in those cases where the corners of the vagina are joined up to the lateral stumps (round ligaments).

3. *Abdominal Panhysterectomy*.—This is not infrequently the operation of *necessity*. It is notably so when the lower pole of a large myoma has expanded the cervical canal and drawn up the portio vaginalis to form part of a capsule.

It is the operation of *choice* in all septic cases, *e.g.* in pyosalpinx, in suppurating ovarian tumours, and in infected myomata.

In such cases most operators will prefer to have an open vagina for free drainage, and except in the worst examples this will suffice, and there will be no need to drain *per abdomen*. The question arises, Ought this longer and more serious operation to become a routine practice, and ought the sub-total method to be abandoned ? Opitz, from an analysis of statistics compiled from German sources, comes to the conclusion that *the risk of the two operations is about the same*. The great argument in favour of total hysterectomy is based on the occurrence of malignancy, especially that occurring in the cervix. The rigid adherents of the amputation-method plead that carcinoma of the body can be detected by having the uterus cut open by an onlooker after its removal ; the cervical stump can then be removed if malignancy of the body is discovered. As a counter-argument it might be urged that sarcoma in a myomatous uterus is not so easy of detection as a carcinoma, whilst it is of great importance as regards panhysterectomy. Another point advanced by the supra-vaginal operators is that cancer of the cervix should be detected before operation, by inspection, or that in the case of an insidious intracervical growth its presence should be suspected by the character of the haemorrhage. I have proved that in

¹ Kelly and Cullen, *Myomata of the Uterus*, 1909, p. 687.

certain instances both these tests have failed to suggest the least suspicion of cancer of the intracervical portion, and only on amputation of the cervix was I able to discover the malignant area. I have seen the uterus divided at its neck for sarcoma in the belief that the disease was myomatous only. Twice at the Samaritan Hospital in one year I saw cancer of the cervix in cases where the uterus had been amputated for myomata. In one I removed the cancerous stump $2\frac{1}{2}$ years after the hysterectomy for myoma; it proved to be one of the most difficult operations I have ever been called upon to perform, and the patient left hospital with a vesico-vaginal fistula. In the other case nothing but an exploratory laparotomy was done, the case proving hopeless.

Herbert Spencer, in his article on "Hysterectomy" in Allbutt and Eden's *System of Gynaecology*, 1909, collected twenty-eight cases in which cancer or sarcoma developed in the cervix subsequent to supravaginal amputation; and it is well known that Spencer is a strong advocate for the abandonment of the amputation method altogether. Up to 1909 Spencer had removed forty-three myomatous uteri by total abdominal hysterectomy, with one death (from embolism, *loc. supra cit.* page 904). Up to 1914 I have performed abdominal panhysterectomy for myomata fifty times, with one death also from embolism. Bland-Sutton says: "This tragic mode of death [from embolism] is more frequent after total than after subtotal hysterectomy." He mentions also that it occurs in 1 per cent at least of the patients who have abdominal hysterectomy performed for myomata. It occurred in three only out of Bland-Sutton's own series of 1500 abdominal operations for these tumours, and elsewhere¹ this author states that the number of panhysterectomies he has performed is 200; but we are not told in which series of cases (the amputations or the extirpations) pulmonary embolism occurred.

In the Kelly and Cullen amputation-series pulmonary embolism occurred four times in 901 cases.

Since my sad experience with cancer of the cervix following supravaginal amputation, I have, as a routine, removed the neck of the womb; but for spinsters and elderly married nulliparae, *i.e.* in patients in whom the risk of cancer occurring in the cervix is reduced to a minimum, the retention of the simpler and more expeditious operation will, as a rule, not only suffice, but will prove the best procedure from every point of view. But the cervix should be amputated low down, and perfect haemostasis should be assured.² I am well aware that the advice to retain the supravaginal operation will be regarded as retrograde by many critics.

¹ *The Position of Abdominal Hysterectomy in London*, 1909.

² John Bland-Sutton, *loc. supra cit.*

Spencer states¹ that the operation of removal of the whole uterus is destined to replace the supravaginal amputation as the intraperitoneal treatment of the stump replaced the extraperitoneal, that is to say, absolutely. This prediction has largely come true as far as many Continental operators are concerned, but that the supravaginal operation will be reserved for certain elderly cases I have not the slightest doubt.

The Ovaries in Hysterectomy

In the technique adopted by Baer, and published in 1892, total ablation of the ovaries was practised. Five years later Bland-Sutton advocated their retention wherever such a course was possible, on the grounds that the possession of these organs after hysterectomy secured for the patient "a more rapid and satisfactory convalescence," and "rescued her from the inconvenience of an acute menopause."²

At this time (1897) Bland-Sutton deemed it essential to leave both ovaries, but in writing again upon the same subject in 1909 he states: "Since 1906 I have modified the method by leaving only one ovary, even when both are healthy, and find that the immediate good consequences of the operation are in no way impaired."³ The same author brings up the subject once more in 1913, saying that it is now admitted by those surgeons in London who have had much experience in hysterectomy for fibroids, that the immediate results of preserving at least one healthy ovary in this operation are admirable, especially in women under fifty years of age; for the retention of an ovary is of striking value "in warding off the severity of an artificial menopause" (Crewdson Thomas).

Kelly and Cullen's view is that when the appendages are normal it is our duty to save the ovaries on both sides if possible.

In one of my own cases a slight show of blood each month indicated that the ovaries were active five years after high amputation of a large myomatous uterus.

At the present time (1914) opinion is not unanimous either in London or in the English provinces on the subject of saving an ovary. My own feeling is one of profound respect for the part played by ovarian tissue in convalescence after hysterectomy in younger women.

With regard to the value of the appearance of the menses after abdominal operations for myomata, opinions have differed considerably. My colleague, Alban Doran, considered it of importance that a portion of the mucous membrane of the

¹ Allbutt, Playfair, and Eden, *System of Gynaecology*, p. 901.

² *Trans. Obst. Soc. London*, vol. xxxix, pp. 282-826.

³ *The Position of Abdominal Hysterectomy in London*, 1909.

body of the uterus should be retained, and practised the Abel-Zweifel technique in order to secure the continuance of the menstrual flow.

Jung seems to favour the same view, since he stated at Halle (May 1913) that several of his patients menstruated after operation. He made use of this fact as an argument against producing amenorrhoea by X-rays. It would be difficult to prove that any physical advantage accrued from the Abel-Zweifel partial hysterectomy, and as regards the mental effect, if a patient is told that she will never menstruate again, it does not appear to be a cause of worry to her.

ADENOMYOMATA

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INTRODUCTION

THE term 'adenomyoma' implies a new formation composed of gland-elements and muscle-tissue. Such a tumour or mass of tissue is not confined to the female genitalia, it is to be found also in the digestive tract (bowel and stomach); and some observers claim that analogous conditions can exist in the gall-bladder, in the kidney, and elsewhere. There is no doubt, however, that the female pelvic organs form the site of election of these tumours, and it is in connection with the uterus, tubes, and adjacent structures that adenomyomata have received particular attention.

It was in the year 1896 that full interest in the subject was aroused by the appearance of Friedrich von Recklinghausen's work, *Die Adenomyome und Cystadenomyome der Uterus und Tubenwandung*.¹ Prior to this date the same author had published two instructive articles, one in 1893, *Über die Adenocysten der Uterustumoren und über Reste des Wolfschen Organs*,² and one in 1895, *Über Adenomyome des Uterus und der Tuba*.³

This observer's final conclusions were that adenomyomata should be divided into two classes :

1. Those situated at the periphery of the uterus and in the tube.
2. Those arising centrally.

The former arose from a numerical increase of the Wolffian tubules, and the latter from the uterine mucous membrane. Von Recklinghausen considered that the latter were rare and that they were prone to undergo cancerous degeneration, since he had seen three cases in which this malignant change had occurred.

His investigations were based on the examination of thirty-four uterine and

¹ Berlin, Hirschwald, 1896.

² *Deutsche med. Wochenschr.*, 1893.

³ *Wiener klinische Wochenschr.*, 1895.

tubal growths. He stated that these growths were only found in the uterus and tubes, and in places where foetal relics contained well-marked layers of muscle-tissue. They were mainly intraperitoneal, of limited size, generally in the peripheral muscular layers, encroaching on the peritoneum (see Fig. 135), and exciting round-celled infiltration in the neighbourhood, as evidenced by connective-tissue adhesions. He noted that cystadenomata may form and spread deeply even into the connective tissues. The tumour, he said, had the appearance of an infiltrating myoma diffusing itself in the muscular wall of the uterus. Four varieties were

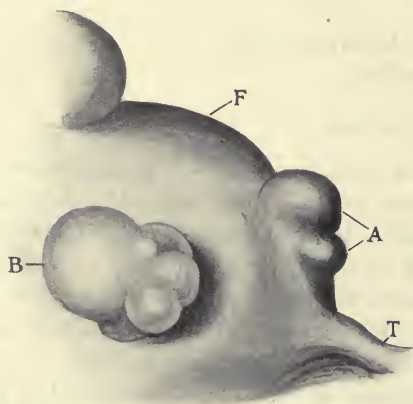


FIG. 135.—Showing *A*, solid adenomyoma situated near the uterine cornu; *B*, small peripheral cystic adenomyoma; *T*, Fallopian tube; *F*, uterine wall. (After Ribbert.)

described: (1) the *hard*, in which the muscle-tissue is in excess of the gland-elements; (2) the *cystic*, with naked-eye spaces possessing gland-tissue and muscle in equal amounts; (3) the *soft*, in which the gland-tissue appears macroscopically as islands, and is the predominating feature; (4) the *telangiectatic*,—soft very vascular growths which are almost devoid of cysts.

Von Recklinghausen noted that these growths were commonest in the posterior wall of the uterus, and that when they occurred in the tube, the ventral aspect of the proximal end of the tube (tubal angle) was the site of election (see Fig. 136). Histologically

he regarded these masses as “organoid tumours” in which the whole structure of a glandular apparatus could be traced, *e.g.* (*a*) narrow straight canals with high ciliated epithelium, analogous to secreting tubules; (*b*) wide tortuous tubes with low epithelium—collecting tubules; (*c*) distension of tubules—ampullae; (*d*) rounded ends—end-bulbs; (*e*) fusion of many tubules to form a principal canal (see Fig. 137). Parallel collecting tubules often opened only upon one side of a principal canal, producing a pectinate arrangement like that seen in the parovarium and in the paroöphoron. In addition to the gland-elements, another typical feature was the *cytogenous connective tissue* which covered the canals and in which they lay embedded (His’s lymphadenoid ground-substance). Around the larger cysts, this tissue was reduced to a minimum, the epithelium lying directly on the muscle, without the intervention of cytogenous tissue. Rounded elevations within some of the cystic

spaces were regarded as pseudo-glomeruli, and to them was attributed the function of secretion and of allowing diapedesis of red discs, which latter were found, together with yellow and brown pigment and hyaline bodies (see Fig. 138), in the stroma surrounding the cysts. Von Recklinghausen argued that as there were no glands in the tubes, adenomyomata at the tubal angle could not arise from tubal mucosa, but were derived from the Wolffian duct. The description he gives of his second variety,



FIG. 136.—Showing adenomyoma of both uterine horns; discrete myomata, diffuse adenomyoma of uterus (3). (Reproduced from Cullen's *Adenomyomata of the Uterus*, Fig. 65, page 240.)

AA' = line through which section *B* was made. *C* = right-sided smaller cornual adenomyoma.

N.B.—The gland spaces in *B* are largest at the periphery. This is the type of growth on which von Recklinghausen based his Wolffian theory. It also corresponds with Chiari's and von Franqué's "salpingitis isthmica nodosa," but, in addition, there is a diffuse adenomyoma of the whole corpus uteri.

i.e. the centrally-situated growth, holds good to this day. The case he described was one of a large adenomyoma of the anterior uterine wall, which was supplied by W. A. Freund. On its mucous surface were seen about eighty ingrowing crypts, into which the mucous membrane passed, dipping for 10, 15, 30 mm. into the growth. There were no peritoneal adhesions.

This second variety of von Recklinghausen is not the class of tumour upon which

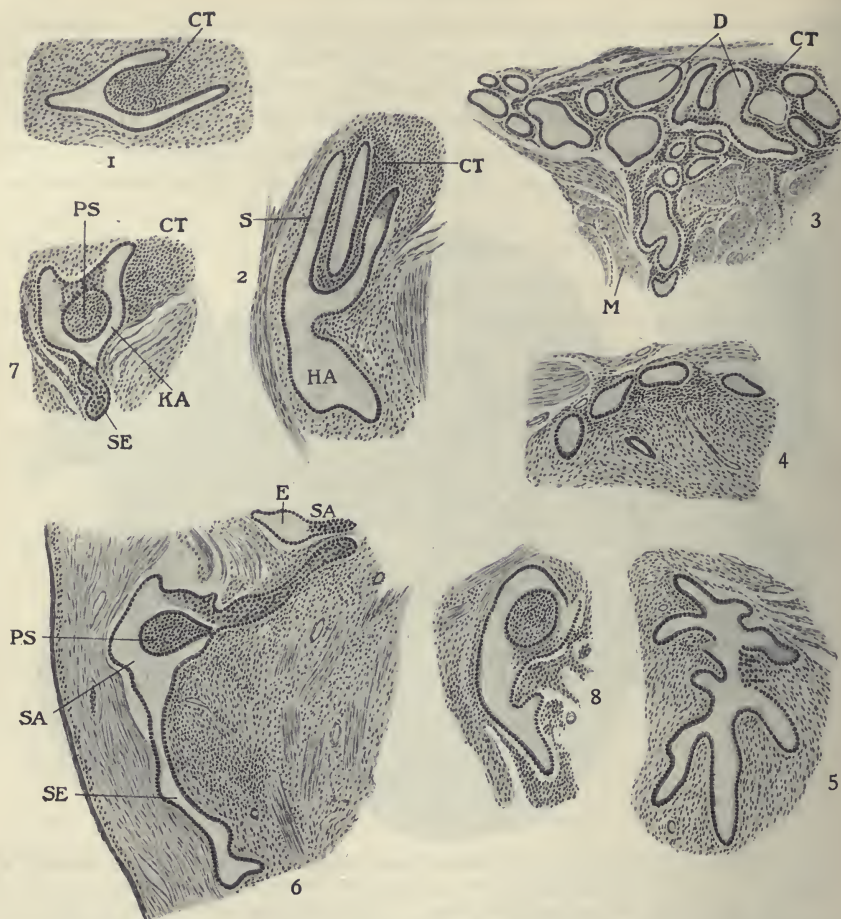


FIG. 137.—Showing eight sections from the periphery of an adenomyomatous nodule drawn by Ludwig Pick to demonstrate the “organoid” morphology these growths were supposed to possess. (From Ludwig Pick’s article, “Ein neuer Typus des voluminösen paröophoralen Adenomyoms,” *Archiv für Gyn.* Bd. liv. S. 117.)

1. Split between two parallel limbs, supposed to represent a “loop” of a Wolffian tubule. CT = commencing formation of cytogenous tissue. 2. A sinuous branched “principal ampulla,” HA; with three parallel “collecting tubules,” S. 3. Island without marked “ampulla.” D = dilated gland-tubules; CT = cytogenous tissue; M = muscle. 4. “Ganse marsch” or single file of four tubules. This is a process of the “collecting tubules” seen in Fig. 140. The tubules are lying in cytogenous tissue. 5. Shows a “principal canal” which is provided with numerous branches. 6. Slightly tortuous “secretion-tube” (SE) expanding into an irregular “ampulla” (SA). In this “ampulla” lies a “pseudo-glomerulus” (PS), and from it a “collecting tube” (SA) runs parallel for a short distance and then terminates in an olive-shaped “end bulb” (E). 7. Twisted “secreting tubule” (SE) with “end-bulb ampulla” (KA); in this is a “pseudo-glomerulus” (PS). CT = cytogenous tissue. 8. The same as 7 from another aspect. 6, 7, and 8 are figures representing that part of the growth which lay directly underneath the peritoneum.

he based his Wolffian theory. The foundation upon which this theory rests is the fact that early in foetal life the Wolffian and Müllerian ducts cross each other at the 'tubal angle,' *i.e.* at the isthmic portion of the Fallopian tube or cornu uteri. It is assumed that the epithelium of the two ducts comes into such close contact that a confluence of these tissues may readily take place. This will provide opportunity for Wolffian 'rests' being found in the interstitial part of the Fallopian tube



FIG. 138.—Showing "pigment-bodies" within the gland-tubules of an adenomyoma. (From F. v. Recklinghausen's monograph, *Die Adenomyome und Cystadenome des Uterus*, Taf. xi. Fig. 1, Case xvi. Adenomyoma of the right tubal angle and hydrosalpinx. From a patient who died of syphilitic pachymeningitis and leptomeningitis cerebri.)

(a) = dilated glands; (p) = "pigment-bodies"; (m) = muscle.

and in the cornu of the uterus. Thus one of the features of von Recklinghausen's adenomyoma was its *localization*. Such growths were peripheral, they lay in the upper part of the uterus in the vicinity of one or other cornu, and were generally posterior. The other characteristic, as already stated, was the peculiar *morphology* which consisted of what was thought to be an exact reproduction in a cornual adenomyoma of the component parts of the mesonephros.

In support of his two main points—localization and morphology—von

Recklinghausen found it necessary to cross swords with those who had worked at a collateral subject, viz. "salpingitis isthmica nodosa," notably Chiari, who in 1887 had placed the pathology of nodular salpingitis on a sound basis. Chiari had shown that, as a result of inflammation, processes of mucosa were forced outwards into the softened infiltrated muscle of the tubal wall. By proliferation of these crypts adenomata were formed in the interstitial part of the tube. Chiari's views were supported by corroborative evidence supplied by Martin, Orthmann, Werth, and Schauta. The cornual enlargements of the Fallopian tubes were therefore, according to Chiari, produced by *histoid* changes consequent on *inflammation*.

This view passed unchallenged until von Recklinghausen's work on adenomyoma appeared nine years later. It soon became clear that what von Recklinghausen was describing as a cornual adenomyoma was in point of fact the same condition to which Chiari had given the name of salpingitis isthmica nodosa. Here was therefore a definite attempt to overthrow the "*histoid*" *inflammatory adenoma*, substituting for it the "*organoid*" *congenital adenomyoma*!

Put as briefly as possible it may be said that in 1896 began a *streitfrage*, or contentious problem, for which it would be difficult to find a parallel in the field of histology. The question of the etiology of adenomyoma was further complicated by the fact that not only were the supporters of the acquired inflammatory theory of cornual tumours arrayed against the upholders of the Wolffian theory, but there were other observers who favoured the theory of a congenital Müllerian origin for adenomyomata. In fact at the time that von Recklinghausen published his important monograph there was a large army of supporters of the Müllerian doctrine already in the field.

Uterine adenomyomata were said to be derived from the Müllerian ducts, according to Diesterweg, Schroeder, Ruge, Schottländer, Hauser, Strauss, Orloff, and Ricker. Tubal adenomyomata were derived from Müllerian tissues, according to Martin, Orthmann, Baraban, Pilliet, and, of course, Chiari. It appears evident that the members of the Müllerian school were not all insistent on the derivation of adenomyomata from *embryonic* Müllerian remains; hence some Müllerian authorities made a compromise with the champions of the inflammatory theory, insisting that what fully-formed Müllerian structures, like tube and uterus, could do in the way of producing adenomyomata when subjected to an inflammatory process, it was rationally to be expected that *embryonic* Müllerian rests could accomplish likewise. The Müllerian supporters never depicted an "*organoid tumour*," *i.e.* an adenomatous growth which showed the mimicry of an embryonic organ.

By this insistence on the "organoid" morphology of adenomyomata von Recklinghausen started a warfare with the whole world of histologists against him. He made at first rapid progress. His theory was fascinating, it drew many volunteers to his standard, but in the end the "*organoid*" picture came to grief. Nor did the *localization* hypothesis upon which such great stress was laid escape disaster, although it never has been so completely annihilated as has the morphological view of von Recklinghausen's tumour. In other words, there are cornual growths of an adenomyomatous nature which are stated to be Wolffian in origin, and the evidence advanced in support of the theory expressed, seems to me in a few instances to be incontrovertible.

Conclusions.—The Wolffian system may occasionally give rise to adenomyomata, notably at the cornu of the uterus and in the round ligament.

2. Von Recklinghausen's interpretation of the component parts (morphology) has been proved beyond doubt to be erroneous.

3. Wolffian adenomyomata are peripheral and not central in their localization.

The Influence of von Recklinghausen on the Question of Etiology : The Decline of the Congenital Theories.—In 1897, one year after von Recklinghausen's work appeared, Ludwig Pick stated that, like Breus and Voigt, he had theoretically held the view that adenomyomata were derived from Wolffian relics.

Pick considered that von Recklinghausen had conclusively settled the point once and for all. In an article of importance, entitled "A New Type of Large Paroöphoral Adenomyoma," Pick illustrates all von Recklinghausen's morphological points, including the collecting tubules, "pseudo-glomeruli," etc. (see Fig. 137), but Pick's deduction that his tumour was Wolffian because of its "organoid" appearance was wrong. It was probably an embryonic growth of Wolffian origin nevertheless, at any rate its *localization* favours this view.

Von Recklinghausen later extended the environment encompassed by his Wolffian theory so as to include those adenomyomata which are to be found at the *outer end* of the round ligament. He argued from Wiegner's statement that the round ligaments spring from the lower pole of the Wolffian bodies. This being so, they were able to carry portions of that body as far as they themselves ran, *i.e.* into the depths of the mons Veneris.

Pfannenstiel (1897) took the same view as regards a growth he found in the inguinal canal, and also utilized the Wolffian theory to account for an adenomyoma of the posterior vaginal wall.

Aschoff (1899) described a growth of the labium majus as Wolffian in origin, and mentioned a case of adenofibroma in combination with a parovarian cyst, which

was quite distinct from the uterus and which, like Pick's paroöphoral tumour, we must regard as Wolffian.

It became the fashion to consider adenomyomata as Wolffian in origin without sufficient evidence; the finding of "pseudo-glomeruli" and pigmented bodies was considered sufficiently conclusive proof to stamp a tumour as a mesonephric derivative. Krönig and many others fell into this error.

Schickele proved to be an obstinate upholder of the Wolffian theory, and in 1904 passed judgment on many cases for which a different etiological explanation had been offered by those who had described them.

Cases described as Wolffian by Hartz, Nebesky, Füth, and Neumann certainly admit of controversy, and in my opinion the etiological conclusions in every one are incorrect. There are many others of which the same may be said.

In tracing the decline of von Recklinghausen's influence, it is right to state that the greatest Anglo-Saxon authority on the subject of adenomyoma was never induced to accept the Teutonic theory. Thomas S. Cullen had formulated his own views two years before von Recklinghausen's work appeared, and these views he has never modified. *Cullen was the first to lay emphasis on the origin of adenomyomata from the mucous membrane of the uterus.* Pick acknowledged the accuracy of Cullen's findings, but would not allow that his conclusions were comprehensive enough to explain *all* adenomyoma. In this opinion I am obliged to agree with Pick, and, as I shall probably have to state more than once, *no one etiological theory can possibly be made to explain all adenomyomata.*

A critique by Kossmann in 1897 proved a severe blow to von Recklinghausen's theory. This author attacked the two chief bulwarks on which the Wolffian theory was based, viz. the *localization* and the *morphology*. As an alternative theory to the Wolffian, Kossmann expounded the belief that the epithelial gland-elements found in the walls of the interstitial part of the tube were due to *accessory* Müllerian ducts, and the same applied to adenomyoma of the uterine walls. This view was branded as unnecessary by Baldy and Longscope, and never received any popularity. Kossman's work was a good example of destructive criticism; as a constructive effort to establish a universal theory it was a signal failure. It was an attempt to revive an older theory (Müllerian) at the expense of the new theory (Wolffian). The result showed that both theories were soon to give place to another etiological point of view which was far more comprehensive in its application to the generality of cases.

As is the case with the Wolffian theory, so with its predecessor—the embryonic Müllerian hypothesis; it holds good for a certain number of cases—

cases which in my opinion are even rarer than those which must be considered as Wolffian.

Figures 139, 140, and 141 show a good example of a cystic uterine growth derived from embryonic Müllerian epithelium. The cyst and adjacent glands make up an 'adenomyoma.'

There is no room to doubt Fränkl's explanation that this structure has to do with some defect arising during fusion of the Müllerian ducts. The central (sagittal)

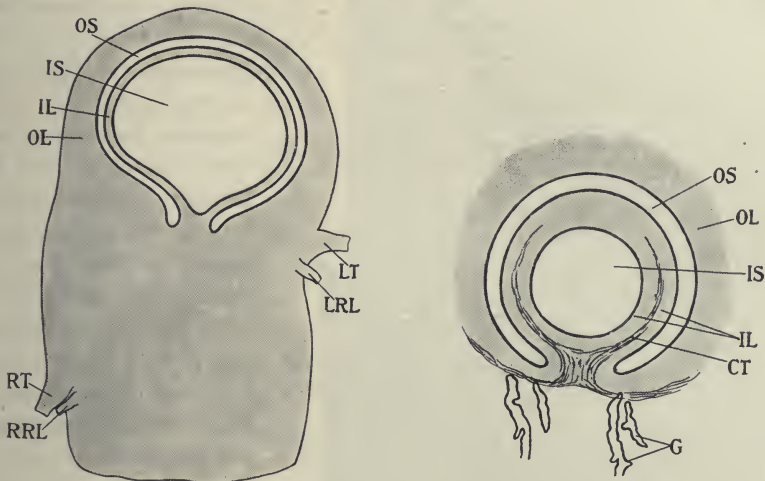


FIG. 139.—Showing diagrammatically the situation of a cystic adenomyoma in the sagittal plane of the fundus uteri as described in the text. (After Oskar Fränkl, *Archiv für Gynäk.* Bd. xciii. Tafel xii.)

OS=outer cavity; IS=inner space; IL=inner lamina; OL=outer lamina; LT, RT=Fallopian tubes; RRL, LRL=round ligaments; CT=connective tissue septum; G=glands in uterine muscle.

plane is the situation where R. Meyer has found epithelial relics in foetal uteri and in uteri up to the age of puberty.

Summary.—1. Both embryonic theories (Müllerian and Wolffian) hold good for a limited number of cases.

2. For the *majority* of cases of uterine adenomyomata the congenital theories have had to give place to the 'acquired mucosal' or 'diverticular' theory of Cullen.

The Mucosal Theory of Cullen.—Cullen's first observations on adenomyomata were made in 1894, and published in 1896. His investigation was carried out on diffuse uterine growths. It received support from the work of von Franqué (published in 1900) on the Fallopian tube. The latter author explained the mucosal invasion as due to

inflammation. This point was not raised by Cullen at all. Cullen, in fact, seems to have been content with proving the *acquired* or mucosal nature of the diverticula, and thus tacitly disproving the *congenital* theory. Von Franqué, by following up Chiari's work, carried the solution of the problem of the etiology of adenomyomata a

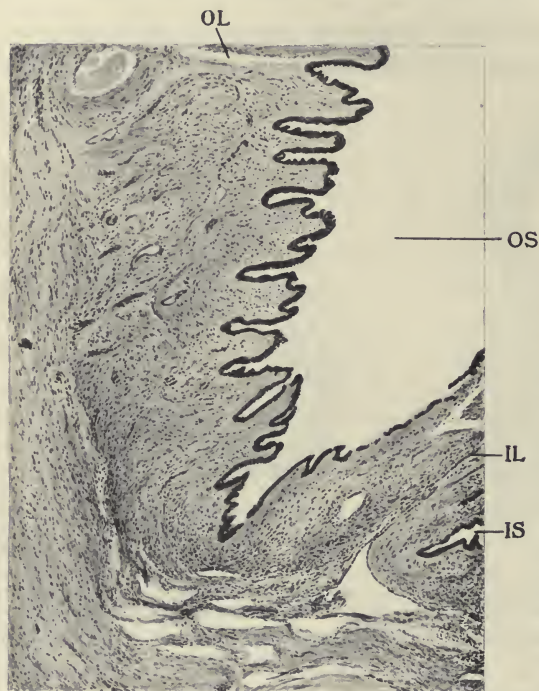


FIG. 140.—Microscopic section corresponding to Fig. 139. The section was taken through the laminae of the cyst. (After Fränkl.)

OL and IL=outer and inner layers; OS and IS=outer and inner spaces.

step further than did Cullen. That is to say, after satisfying himself that mucosal diverticula resulted in glandular proliferation he raised the question, "Why does the mucosa infiltrate?" This he answered by demonstrating afresh what Chiari had done, viz. that the epithelial infiltration was a phenomenon found in connection with partly-healed salpingitis, and notably so in tuberculous cases. This view as to an inflammatory factor was soon applied to adenomyoma of the uterus. Felix Legueu and Marien of Montreal attributed the adenomyomatous condition of the uterine wall to a preceding chronic inflammation of the endometrium.

Paul von Lockstaedt of Königsberg accepted Legueu and Marien's view as to the mucosal origin of their

growth, and described his seventh case as also derived from the mature mucous membrane.

Lockstaedt remarked that the number of mucosal growths, in comparison to that of Wolffian adenomyomata, had greatly increased (1898).

Baldy and Longscope, whilst falling into line with their fellow-countryman Cullen, did not consider it necessary to accept the inflammatory factor as explana-

tory of the mucosal invasion. Like Cullen, they admit the fact, but leave it unexplained. R. Meyer in 1897 accepted the mucosal theory in part, in so far that he regarded it as the correct explanation of three of his cases of cornual adenomyomata; but considered that the remaining three were Wolffian.

The mucous-membrane origin of adenomyomata received increasing support and steadily supplanted the foetal-relic hypothesis. In 1900 Gottschalk described a cystic tumour in the region of the epoöphoron as mucosal in origin, because he found outgrowths of the tubal mucosa on serial section. Opitz in the same year contributed further evidence in support of the mucosal theory.

In 1901 E. Kehrer worked on the same lines with similar results. His researches confirmed those of Chiari, Martin, von Franqué, and Opitz; and like Opitz, Kehrer laid stress upon the association of cornual adenomyomata and tubercle, but he also included gonorrhoea as a causal factor, and stated that the site of election for the tumour was the *pars isthmica* in gonorrhoea and the *pars intramuralis* in tubercle. Further confirmatory evidence of the mucosal theory was furnished by Lubarsch in 1902, also by Heine and R. Meyer in 1903. Meyer extended the investigation of Kehrer and von Franqué (who mainly studied tuberculous and gonorrhoeal tubes) to salpingitis of every description. He found that the cause of the inflammation was of no moment, mucosal invasion occurring in every type of inflamed tube. It produced a condition at the tubal angle which resembled von Recklinghausen's "organoid" cornual adenomyoma. It was, however, a definite *post-foetal* phenomenon.

The inflammatory causation of adenomyoma was never employed extensively



FIG. 141.—Microscopic section showing the glands ramifying in the uterine muscle at the point marked G in diagram, Fig. 139. (After Fränkl.)

to explain the invasion of the uterine wall by mucous membrane, as we see it in the well-known diffuse uterine adenomyomata.

As already stated, Legueu and Marien argued from tube to uterus, Cullen never did; and it is noteworthy that in Robert Meyer's excellent description of the histology of the condition he laid stress only on *mechanical* factors, and considered that the opportunity for mucosal invasion was brought about by lesions produced by therapeutic means and by gestation and labour. The want of a true submucosa was also not to be lost sight of as a contributing factor.

Ribbert likewise opposed the theory of irritative or inflammatory genesis, and figured two growths which he considered disproved the inflammatory theory. In one uterus there were five myomata, two submucous and three interstitial. The two former were invaded by the mucous membrane, but there was no sign of endometritis according to Ribbert. My own view on this specimen is that the mucous polypi which were present strongly suggest a chronic endometritis, so that I am not able to accept this case as disproving the inflammatory factor. On this author's other case, which he uses for the same purpose, it is difficult to express an opinion one way or the other.

Conclusion.—The majority of adenomyomata are *post-foetal*, and derived from the mucosa of the tubal angle and from that lining the cavity of the uterus. In the case of tubal growths the cause of the mucosal invasion has been clearly proved to be inflammation, and the inflammatory process is frequently tubercular.

The relationship between inflammation (endometritis) and uterine diffuse adenomyomata is far less definite. In the case shown in Figure 142 it is possible that both processes were at work, the mucosa of the tubal angle providing the peripheral cyst and that of the cavity of the uterus providing the diffuse central adenomyoma. An ascending infection would render such an event possible.

Epithelial Heterotopy and the Relationship of Inflammation to Adenomyomata.

—The term 'epithelial heterotopy' was given by Robert Meyer to the phenomenon of epithelial displacement or invasion, such as we see demonstrated in adenomyomata.

This power of invasion by an epithelial membrane is not confined to any one special viscus or bodily structure. In the uterus it gives rise to a penetration of the muscular walls by the mucous membrane, and the same occurs in the Fallopian tubes. But similar invasion has been shown by Meyer to occur in the alimentary canal. Lubarsch has studied it in the appendix, gall-bladder, kidney, and liver. Friedländer found the same invasions in connection with lesions of the skin. As will be shown later on, the peritoneum also affords examples of this same epithelial heterotopy.

Meyer was at great pains to point out that this power of penetration of the subjacent tissues by the overlying epithelium was in no sense a malignant process. To trespass at all, the epithelial cells must of necessity break through their basement membrane, *i.e.* they must overstep what is commonly considered to be the physiological boundary. Meyer said it was high time that the old non-proven fable, which asserts that the transgression of the physiological boundary signifies malignancy, should be brought to book. Scattered heterotopic epithelium *could* become cancerous, but the proof that it did so was hard to demonstrate. Rupture

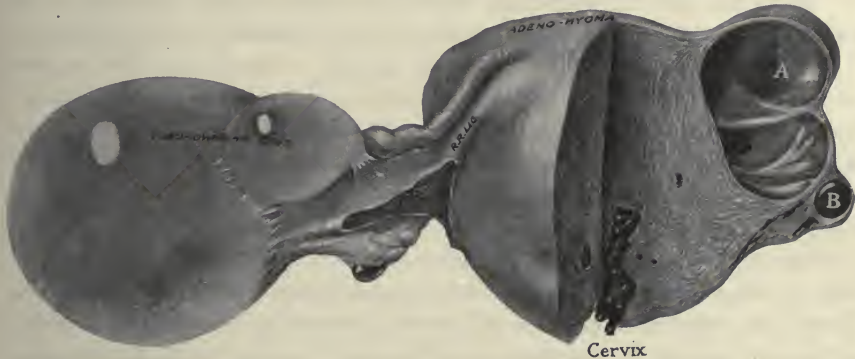


FIG. 142.—Diffuse adenomyoma of the uterus with cystic spaces in the left uterine cornu ($\times \frac{1}{2}$).
(After Cullen's Fig. 36, page 120.)

A = cystic space lined by columnar ciliated epithelium. B = space filled with blood-clot. The mucous membrane of the cavum uteri invaded the muscularis for a considerable distance, but there is no mention of ciliated epithelium in the glands which communicated with the cavity of the uterus. Cullen's view is that cystic spaces occur in parts removed from the pressure of the uterine wall, hence the frequency with which they occur in a peripheral situation.

of the basement membrane is no unequivocal sign of malignancy. There must be a biological abnormality of the epithelial cell for it to set up a malignant process.

The Relationship of Inflammation to Epithelial Invasion.—The cause of the infiltrative activity on the part of epithelium is a pre-existing *inflammation*. Granulation-tissue, areas of round-celled infiltration, and proliferating connective tissues are all permeable to benign invading epithelium.

In chronic inflammation the invading epithelium runs along the vessels, but the endothelium of blood-vessels and lymphatics proves to be an insuperable barrier to the trespassing cells. They are never found *inside* a blood-vessel or lymphatic.

Epithelial heterotopy is a healing process, the sequence of events being *injury*, *regeneration*, *epithelial heterotopy*. In the reparative stages of tuberculous salpingitis inspissated caseous deposits in the muscularis have been found to be

surrounded by a wall of epithelium which has come from the lumen of the tube by the process of 'heterotopy' or displacement. Erosion of the cervix affords another example of the same reparative change. Here the epithelium from the cervical canal or from the cervical glands bursts its basement membrane and covers an inflammatory granulation-area in an attempt at repair.

Meyer considers that in 'glandular endometritis' the same process is at work. He regards the excess of glandular tissue in this case as being due to an *intra-mucosal* epithelial invasion of inflammatory origin.

When the invading epithelium penetrates muscular plains, the result is an adenomyoma. When fibrous tissue is involved, the resultant is a fibro-adenoma.

As adenomyomata afford us the best example of benign epithelial invasion or heterotopy, and as this epithelial heterotopy is essentially an inflammatory phenomenon, it points to the conclusion that adenomyomata themselves are examples of an inflammatory product. Nature intended the invading epithelium to aid in the repair of the damage done by inflammation. In adenomyoma we seem to see this process of repair over-reaching itself.

In chronic endometritis we see epithelial heterotopy demonstrated as depressions of the mucosa running for a short distance only into the muscularis. In adenomyoma the process runs riot and causes injury instead of repair by trespassing to the outer limits of the muscular walls. The injury thus produced is demonstrated, histologically, as muscular hyperplasia and clinically by haemorrhage and pain.

Conclusion.—The appreciation of the relationship of epithelial heterotopy to inflammation :

1. Paved the way for the acceptance of the serosal origin of adenomyomata.
2. It created a new idea of the nature of adenomyoma altogether, by leading to the tumour-elements, both glandular and muscular, being regarded as the outcome of inflammation, and the increase in the muscularis as being due to hyperplasia produced by chronic inflammation.
3. Acceptance of Meyer's views on the inflammatory theory and epithelial heterotopy does not affect the two great outstanding theories—those respectively of the congenital and acquired origin of adenomyoma.

Displacement of epithelium occurring in a fully-formed adult mucous membrane is spoken of as "orthotopic heterotopy"; when occurring in congenital relics it is spoken of as "distopic heterotopy."

The Serosal Theory of Iwanoff.—Cystic epithelial spaces within myomata were first microscopically traced to an origin in the peritoneum by Iwanoff of Petrograd. This author's original paper on this subject was published only in Russian. I

cannot give its date. In 1898 Iwanoff again drew attention to the serosal origin of the gland-elements in adenomyomata of the uterus, this time in a paper written in German.¹ Later on, the serosal theory had the support of Pick, Opitz, Aschoff, Borst, Heine, von Rosthorn, Renisch, and Robert Meyer.

That the flattened endothelial cells of the peritoneum are able to undergo metaplasia to such a degree as to become cubical or even columnar may appear at first somewhat startling. Nevertheless it is certain that this change in the character of the serosal cells can and does happen. Under what conditions does it occur? Alfieri seemed to think it was a concomitant of pregnancy. Ziegler recognized the phenomenon and described it as a "regenerative process," *i.e.* a stage in the healing of any epithelial structure which had suffered injury.

Meyer definitely attributed it to inflammation. He showed, as many other observers have done before and since, that epithelial displacement or *heterotopy* occurs in connection with the serosal as well as with mucosal membranes. Under the influence of an inflammatory stimulus the peritoneal epithelium proliferates, and sends down buds of cells into the subjacent tissues. The buds then proliferate and form branching tubular adenomatous processes. These processes are lined by columnar epithelium, and the crypts are indistinguishable from those derived from an invasion by true mucous membrane. Nor is this all; the connective tissue adjacent to the adenomatous processes changes its character as the result of inflammation, and becomes the cytogenous tissue which, as we have previously stated, is one of the predominating features of adenomyomatous growths, and this cytogenous or lymphadenoid tissue, even in serosal adenomyomata, takes on decidual reaction in response to the influence of pregnancy. Figure 143 shows the transition of flattened epithelium into columnar, and the commencement of the formation of cytogenous tissue around the glandular space.

Many of the cases of subperitoneal uterine growths, and also many extra-uterine 'tumours,' notably those in the rectogenital space, owe their gland-elements to serosal inclusion. This subject will be referred to under various headings. It will suffice to cite here the case of Klages, which was that of an adenomyoma in the scar of a laparotomy wound. The patient was a middle-aged woman who had had many attacks of pelvic peritonitis. In March 1903 the right tube and ovary and also the appendix were removed, and the womb sewn to the abdominal wall. For two years the patient had noticed a gradual thickening and redness at the lower end of the laparotomy scar. This was noticeable *especially during menstruation*, when the

¹ N. S. Iwanoff, "Drüsiges cystenhaltiges Uterusfibromyom, etc.," *Monatsschr. für Geb. und Gyn.* Bd. vii. S. 293, 1898.

redness increased and the scar became painful. The pain was of a pricking, tearing character, and ultimately the patient could not bear the pressure of her clothes on the swelling. The diagnosis lay between keloid and neuroma. On removal, the lump was larger than a walnut, and proved to be an adenomyoma united to the uterus by a pedicle which included a portion of omentum. Topographically, it could not have arisen from embryonic germ-cells. There was no communication, Klages said, between the mucosa of the uterus and the tumour (the uterus was not removed). This author adopts the same view as did Meyer for a similar case, that the epithelial

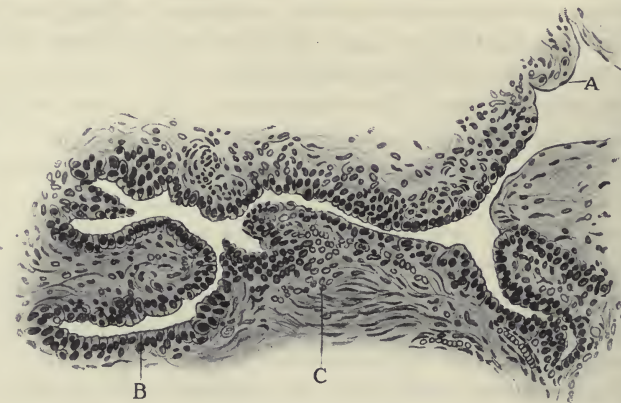


FIG. 143.—Showing invasion of the underlying tissues by peritoneal epithelium.
(After Sitzenfrey, *Zeitschr. für Geb. und Gynäk.* Bd. lxiv. Fig. 3, page 551.)

A = flattened epithelium, i.e. the endothelium of the peritoneum ; *B* = columnar epithelium ; *C* = connective-tissue cells commencing to form the cytogenous tissue.

inclusions were serosal, and quotes one of Heine's cases as also derived from the peritoneum.¹

To explain the muscular and connective-tissue elements Klages adopts the view of Opitz as to the etiology of myomata, a theory which has already been referred to in the section dealing with those growths (see Vol. II. p. 191). The gist of this theory is, that just as early connective tissue can elaborate or evolve muscle-fibres out of itself, wherewith to clothe the Müllerian ducts and eventually to form the uterus, so can the connective tissue which remains in the uterine wall generate muscle-fibres to form myomata in mature life. Therefore the muscle and connective tissue in the above 'growth' came from the uterus according to the author's view.

With regard to the behaviour of peritoneum under the influence of an inflam-

¹ Heine, *Inaug. Diss. Berlin*, 1903.

matory excitation, Klages says "that the transition of flat peritoneal epithelium into cubical or cylindrical can occur, has been proved by other authors, *e.g.* Opitz and Robert Meyer." In Figures 144 and 145 Klages clearly shows this transition in

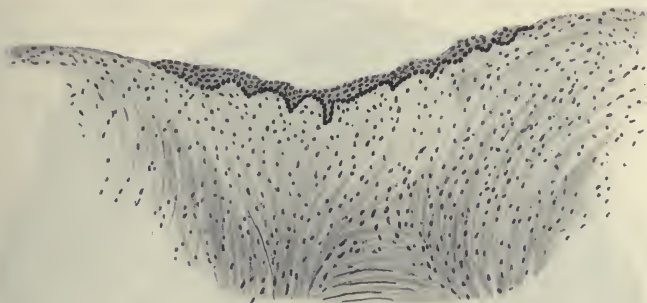


FIG. 144.—Showing the early stage of epithelial downgrowth into the subjacent tissues from the peritoneum.
(After R. Klages, Fig. 9, Tafel v., *Zeitschr. für Geb. u. Gynäk.* Bd. lxx.)

shape, and in Figure 144 the commencement of the infiltrative process is seen. Opitz found that where the peritoneum lies in natural folds, as it does at the tubal angles, the initial condition already exists for the down-growth of epithelial elements. Figure 144 shows this, a deep process has started to grow down, and Klages says, "such a demonstration cannot be thrown overboard."

The peritoneum itself arises from coelomic epithelium; so why has it not the same properties in regard to adenomyomatous growths as the epithelium of Müllerian ducts which are a product from the same source?

Klages quotes Iwanoff, Fabricius, R. Meyer, and Pick as authors favouring the serosal origin. Figures 146 and 147 show the naked-eye and micro-

scopic characters of subperitoneal epithelial cysts investing a large myoma. Cullen regards the cysts as Müllerian, but in my opinion they are serosal.

Meyer states that the serosa can form a definite mucous membrane resembling that of the uterine cavity. He described one case where such a glandular membrane covered the whole of the back of the uterus. I have found two other similar cases in the literature on adenomyomata—one by Semmelink and Josselin de Jong, and one by Louis Bazy. The former authors admit the possibility of the serosa being able

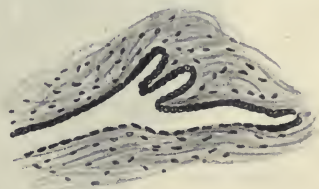


FIG. 145.—Showing the transition of flattened 'endothelial' cells into columnar cells.

(After Klages, Fig. 8, Tafel v., *l.s.c.*)

to produce a mucosa such as is seen in Figure 148, but they could not show the actual continuity with the peritoneum, because that had been destroyed by "blunt dissection" during removal. They proved by microscopic examination that the mucous membrane



FIG. 146.—Subperitoneal cystic adenomyomata occurring in the case of large myomatous uterus.

(Fig. 39, page 134, Cullen's *Adenomyoma of the Uterus*.)

A and *B*=myomata; *C* and *D*=cystic adenomyomata. *D* shows the area from which the microscopic section illustrated in Fig. 147 was taken.

of the uterus took no part in the adenomyomatous process; they also rejected the embryonic Müllerian theory on morphological and topographical grounds. Finally they adopted the Wolffian theory (reluctantly as it seems to me), but they were driven to admit that the serosal explanation could not be made to cover a large left-sided cornual cyst, and sundry other interesting features of the growth.

I state the case here to show to what extent the serosa is considered to be capable of producing adenomatous tissues.

Cullen's Classification of Adenomyomata.—In writing upon the Origin of Adenomyomata of the Uterus in 1908, Cullen (pp. 193, 194) leaves the question of the inflammatory origin severely alone; the serosal origin is, therefore, of necessity not discussed, and up to that date this author had met with no case of 'adenomyoma' in the recto-genital space. The only extra-uterine cases which Cullen had seen were those of the utero-ovarian and round ligaments, and of these



FIG. 147.—Showing microscopic features of spot D in the preceding Figure 146 ($\times 6$).

A is the solid myomatous tumour. b = the myomatous wall of cyst. c and d = spaces lined by cylindrical epithelium. b' = outer peritoneal covering. ff = cysts which Cullen considers resemble uterine glands, and which he regards as arising from the remains of Müller's ducts. These superficial cysts may very possibly be serosal in origin.

he gives a good account on pp. 254-259 of his monumental work, *Adenomyoma of the Uterus*, 1908.

Cullen's work afforded the most comprehensive and conclusive proof of the fact that most uterine 'adenomyomata' are of mucosal origin. He says: "We have had fifty uncomplicated cases of *diffuse* adenomyomata of the uterus, some very extensive, others in their early stages. In every one of these cases we have been able by persistent search to trace uterine mucosa into the myomatous tissue. In other words, islands of mucosa in the diffuse myomata originated from the mucosa lining the uterine cavity in *every case*." Furthermore, Cullen states that it is not necessary that the uterine glands be traced by continuity to establish the mucosal origin. He says: "The islands of glands lying deep down in the myomatous muscle (*sic*) correspond identically with those seen in cases in which the continuity is traceable, and moreover, they are precisely the same as in normal uterine mucosa. They

are surrounded by a stroma identical with that surrounding uterine glands. In some cases *miniature uterine cavities* are scattered throughout the myoma. Now, if portions of this uterine mucosa be far removed from the parent mucosa, we should still expect them to retain their function, and this they do. In nearly every instance in which cystic spaces are present, the cavities are, in part or almost completely, filled with blood; and even in the small and undilated glands blood is frequently present, or the epithelial cells contain blood pigment, the remnants of old hæmorrhages." To clinch his argument he cites the case of Whitridge Williams who, in examining the uterus of a patient entering hospital in a desperate condition and dying two hours after labour, found that it was the seat of a diffuse adenomyoma, and that the stroma of these islands had become converted into typical decidua.¹

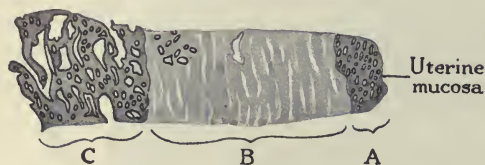


FIG. 148.—Showing a transverse section taken through the uterine wall in the remarkable case of Semmelink and de Josselin de Jong. (*Monatsschr. für Geb. u. Gyn.* Bd. xxii., S. 238, 1905.)

A = mucous membrane of uterine cavity. B = muscle wall of uterus (normal). C, "Acquired mucous membrane" which covered the whole posterior surface of the uterus in the place of normal peritoneum.

submucous adenomyomata. He puts it thus: "It is so easy to understand how interstitial myomata become subperitoneal or submucous, and yet in considering the *subsequent* history of adenomyoma the majority of authors have forgotten to apply the same principle. When the growth becomes subperitoneal we should expect its glandular elements gradually to lose their continuity with those of the mucosa, and such is the case. Hence the confusion as to their origin. Cullen, from an experience gained by the study of fifty-six adenomyomata, divided these growths into:

1. Those in which the uterus preserves a relatively normal contour.
2. Subperitoneal and intraligamentary adenomyomata.
3. Submucous adenomyomata.

1. The uterus may be normal in size, or two or three times the natural dimensions. If large, it is frequently invested by adhesions. One wall (more frequently

¹ J. Whitridge Williams, "Decidual Formation throughout the Uterine Muscularis," *Transactions of the Southern Surgical Association*, 1904, vol. xvii.

the posterior) is the seat of a diffuse muscular hyperplasia, and into this thickened musculature it is often possible to trace invasions direct from the mucosa, and in advanced cases cystic spaces open on to the mucous surface. The mucosa itself is often thickened, but may be atrophic. Small myomata may be present in other parts of the uterine wall. They stand out as much paler and more definitely circumscribed rounded structures, and offer a strong contrast to the diffuse pinkish hyperplastic area which makes up the adenomyoma.

2. *Subperitoneal and intraligamentary Adenomyomata*.—Out of fifty-six cases Cullen found subperitoneal growths in eight. Three were removed by excision and



FIG. 149.—A cystic subperitoneal adenomyoma arising from the anterior wall of the uterus and communicating with the uterine cavity. (After A. Bauereisen, *Beitr. zur Geb. und Gyn.* Bd. ix., 1905.) To be compared with von Recklinghausen's case, Fig. 150, and with Döderlein and Herzog's case, Figs. 191 and 192, pp. 364 and 365.

the uterus was left behind, so presumably the growths were small nodules. Personally, I feel that Cullen pushes his mucosal theory too far in extending it to all subperitoneal adenomyomata. Some of the classical cases of subperitoneal growths prove his point, notably one by Bauereisen and one by von Recklinghausen which are shown in Figures 149 and 150. On the other hand a case recorded by Robert Meyer (see Figs. 151, 152, and 153) to my mind proves that Cullen's generalization is at fault, and I hold that Meyer's contention that his growth arose in the Wolffian system was clearly proved. Meyer has also shown that subperitoneal uterine adenomyomata may owe their inclusions of epithelium to the serosa. These, he says, are "of no great size," as a rule, but there were many exceptions, notably those of Nebesky,

Füth, von Franqué, and von Rosthorn. In one Meyer described nearly the whole of the back of the uterus as covered by a "mucous membrane," and by a low magnification the serosa could be seen sending down growths deep into the uterine muscle. Cullen's case (Figs. 154 and 155) is probably Wolffian also.

As regards intraligamentary adenomyomata being mucosal, Cullen's view was borne out by Döderlein and Herzog's case (see p. 364), but again a mucous-membrane origin for these growths cannot be accepted as universal (see Extra-Uterine Adenomyomata).



FIG. 150.—A cystic subperitoneal adenomyoma arising from the anterior wall of the uterus and communicating with the uterine cavity (cp. Fig. 149). (After v. Recklinghausen, *Die Adenomyome und Cystadenome*, Taf. xi.)

Figure 156 shows a small subperitoneal cornual growth which I removed from a case diagnosed as tuberculous nodular salpingitis. The tube was not excised, as it appeared healthy. Plate XXVI. (opposite p. 360) shows the microscopic features of this growth. As the tube and uterus were left intact, I am not in a position to say whether the gland-spaces arose from the mucous membrane or from the serosa.

3. *Submucous Adenomyomata*.—In Cullen's series he encountered seven cases of submucous growths. In one

instance the glands had become cystic (see Figs. 154 and 155), and the tumour "was riddled with miniature uterine cavities" continuous with the uterine mucosa. The cases of Diesterweg and of Schroeder were polypoidal submucous growths. In 1906 Frank Taylor showed an adenomyomatous polypus of the cervix for which Herbert Spencer preferred the name "adeniferous fibroid polypus"; both Spencer and Routh were familiar with this kind of polypus, and the new discovery claimed by Taylor was not admitted. Such growths are easy to understand, if regarded from the point of view adopted by Cullen.

Schroeder's view that a myoma in its growth embraced the mucous membrane was soon shown to be contrary to all known facts. I personally agree with Spencer and Routh that polypoidal growths should be excluded from the category of adeno-

myomata, the more so as the literature on adenomyoma is already becoming very extensive without the inclusion of polypi. With large *sessile* submucous growths it is another matter altogether, as I hope to show later.

Summary of Cullen's Views.—If I have read him aright, Cullen's views respecting adenomyoma may be summed up as follows :

1. All adenomyomata are Müllerian in origin.

2. Central uterine adenomyomata derive their gland-elements from the mature mucous membrane of that organ, and those situated on the periphery from Müllerian relics.

3. Adenomyomata are the result of the invasion of a pre-existing *myoma* by uterine mucous membrane or by Müllerian relics. Hence :

4. Adenomyomata should be classified in the same way as myomata.

5. Extra-uterine adenomyomata derive their adenomatous tissue from congenital Müllerian relics.

6. Even when no connection can be traced between the mucous membrane of the uterus and the gland-tissue of an adenomyoma, the latter may be safely regarded as Müllerian because of its similarity in structure to the uterine mucosa.

7. Evidence confirmatory of (6) is found in the physiological behaviour of the cytogenous tissue. It becomes congested and haemorrhagic during menstruation, and undergoes decidual reaction during pregnancy.

Brief Comments.—Taking the points *seriatim* :

1. All adenomyomata are not Müllerian, some have been proved to be Wolffian and some serosal.

2. The mucosal origin holds good for the commonest clinical variety, viz. the

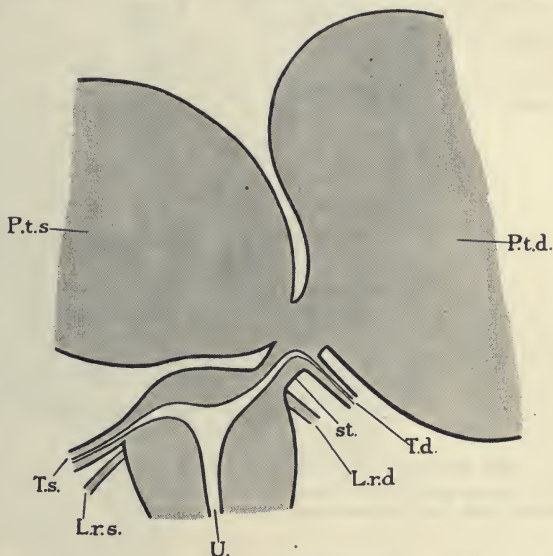


FIG. 151.—Scheme of a large bilobed adenomyoma growing from the right cornu of the uterus.

(After Robert Meyer, *Zeitschr. für Geb. u. Gyn.* Bd. xlix., 1903, Fig. 1, page 467.)

U = Uterine cavity ; L.r.s and L.r.d = left and right round ligaments. Pt.s and Pt.d = left and right portions of tumour. T.s and T.d = left and right Fallopian tubes. st = pedicle of bilobed tumour.

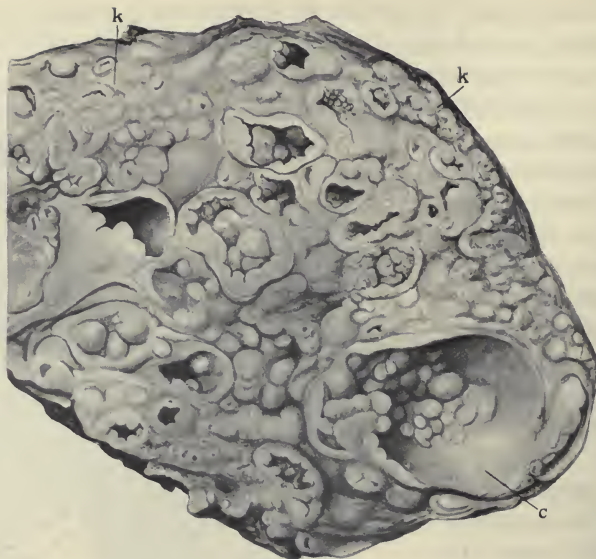


FIG. 152.—Macroscopic view of a portion of the bilobed tumour described by Robert Meyer. *C*=large cyst showing intracanalicular fibromata. *KK*=tortuous duct with here and there a definite lumen which could be seen by the naked eye.

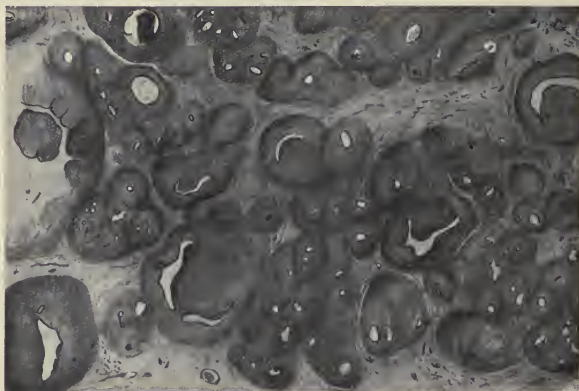


FIG. 153.—Section of Robert Meyer's tumour under a low power. The "tortuous duct" mentioned in the text is here seen in transverse section to possess a very thick wall. Its lumen is often sickle-shaped from the projection into it of "intracanalicular fibromata." (After Meyer, *l.s.c.*)

diffuse central uterine adenomyoma. Cullen deserves the fullest credit for being the first to point this out.

Peripheral subserous uterine growths are not necessarily mucosal, they may be Wolffian or serosal.

3. A pre-existing myoma is not essential; some tumours suggest the idea of an invasion of a myoma, others do not, but are better described as examples of *adenomyositis*.

4. Lack of uniformity in the development of the gland-tissue robs Cullen's classi-

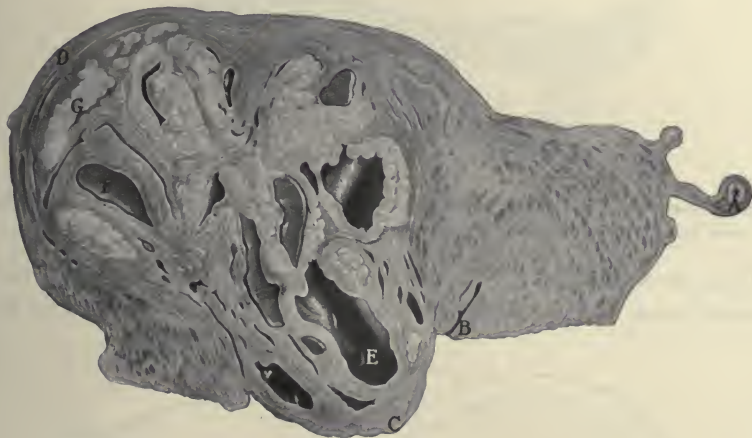


FIG. 154.—A cystic intraligamentary and partly submucous adenomyoma.
(Reproduced from Cullen's Fig. 44, page 152.)

A = cross section of left Fallopian tube; B = small portion of uterine cavity; C = submucous portion of growth; D = intraligamentary pole of growth; E = irregular cyst; F = cyst filled with coagulated contents; G = myomatous tissue.

fication of any practical value. If we could adopt with Cullen a single view on the genesis of the epithelial constituents, we should find his classification of adenomyomata not only rational, but most helpful.

5. Similarity of structure is a misleading guide to etiology. Decidual reaction has been observed in various situations during pregnancy. It is not invariable in adenomyoma; reputed serosal growths have shown the change, whilst mucosal growths have failed to demonstrate it.

6. But it is a curious clinical fact that peripheral adenomyomata have been observed to swell up and become painful *during menstruation*. This forms the coping-stone of Cullen's argument. Do all peripheral adenomyoma act in this way?

7. The simplest classification of adenomyomata is to divide these clinical tumours into *uterine* and *extra-uterine*. The uterine may again be sub-divided according to clinical observation into central and peripheral. The central are mucosal in origin. The genesis of the peripheral is debatable.

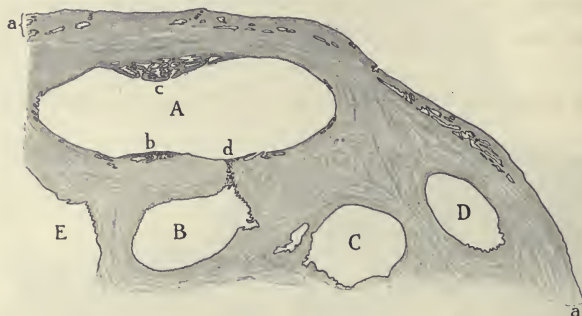


FIG. 153.—Section $\times 5$ of submucous portion of cystic adenomyoma seen in Fig. 154. (After Cullen.)
a = Uterine mucosa, its stroma is rarefied; *c* = mass of hypertrophic glands within cyst *A*.

After the preceding introductory remarks concerning the debatable etiology and classification of 'adenomyomata,' endeavour will now be made to give a

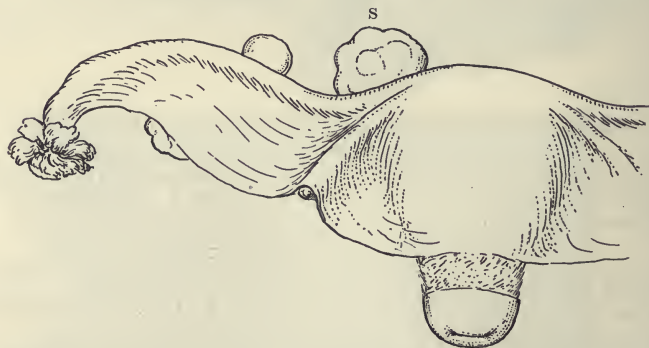
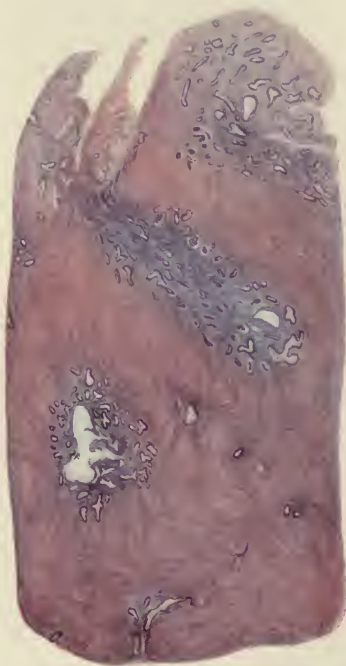


FIG. 156.—Diagrammatic representation of a small cornual adenomyoma containing cystic gland-spaces which are shown in Figure A, Plate XXVI. p. 360. The smaller and more external growth is a fibromyoma.

systematic description of these growths. For this purpose it is convenient to adopt a *new classification* and consider the subject under the following headings.

- | | |
|-------------------------|-------------------|
| 1. Uterine adenomyomata | { (a) Central. |
| | { (b) Peripheral. |



Section showing mucosal invasion of the musculature of the uterus commencing near the tubal angle. It is typical of the gland-distribution as seen in diffuse adenomyoma of the uterine body.

2. Extra-uterine adenomyomata,
i.e. those arising in
- | | |
|---|------------------------------|
| { | (a) The Fallopian tube. |
| | (b) The round ligament. |
| | (c) The ovarian ligament. |
| | (d) The broad ligament. |
| | (e) The recto-genital space. |
| | (f) The alimentary tract. |

I. Uterine Adenomyomata

(a) **Diffuse Adenomyoma of the Uterine Body.**—This is a pathological condition which is confined to the body of the uterus, the cervix being exempt; it cannot be diagnosed with any certainty. In the majority of cases it will be regarded clinically as a myoma, and more rarely as a case of subinvolution of the uterus or chronic metritis. An adenomyomatous uterus is never a very large organ; in fact its size may be normal, or at the most not larger than a three months' gestation. Hence large myomata will not come into the question of differential diagnosis, whereas in certain cases, the subinvoluted chronic metritic uterus will have to be considered. The surface of the uterus may be quite smooth, but it is very common to find it nodular from the presence of small discrete myomata (see Fig. 146). Adhesions are also very common, so are inflammatory lesions of the Fallopian tubes and ovaries. An adenomyomatous uterus may therefore be fixed or semi-fixed in the pelvis, and the condition may be masked by clinically predominant adnexal complications such as pyosalpinx.

The *symptoms* are no more distinctive than the physical signs. They are those of menorrhagia and pain; for a full discussion of these the reader is referred to diagnosis (p. 381). It is enough to state here that a myoma will provide all the symptoms noted in adenomyomata, and that when uncomplicated by inflammatory processes the latter may cause no pain whatever. The presence of an adenomyomatous condition of the uterine body is usually first discovered on slitting up the organ after its removal. It is commonly noted that the walls are very hard, and in some cases are cut into with difficulty; the density and toughness are altogether greater than that of a myoma. One wall only, the posterior (see Fig. 158, also Fig. 160, p. 332), is commonly affected, but the change may involve both anterior and posterior walls (see Fig. 157). The 'growth' commonly starts near one or other cornu and spreads upwards to the fundus and downwards towards the internal os, but it does not invade the cervix. It is in no sense circumscribed, but appears as a diffuse hyperplasia of the muscle-wall, which on section is wanting

in the whiteness so characteristic of a myoma when seen in section. The adenomyomatous tissue does not differ much in colour from the surrounding muscle. Not being circumscribed, there is not the same tendency to extrusion, which is so characteristic of an interstitial myoma when the investing uterine wall is incised. Occasionally these central growths project as a submucous tumour into the cavity of the uterus. The mucous membrane overlying the hyperplastic area

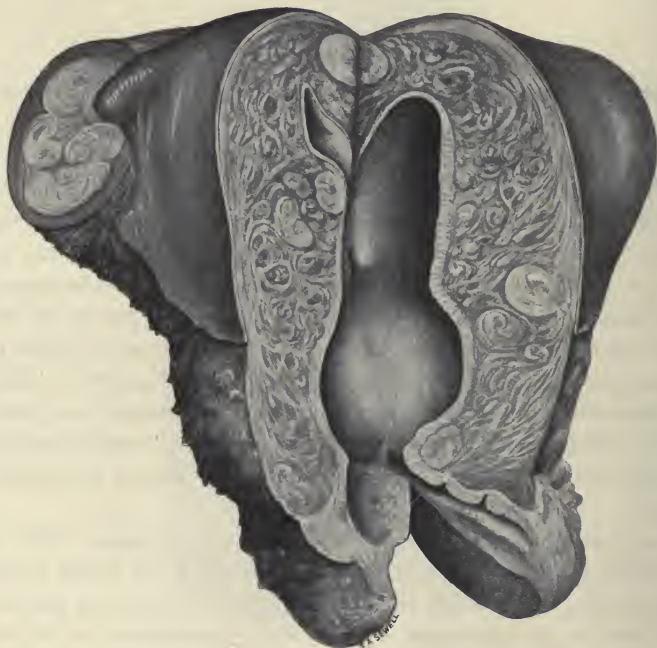


FIG. 157.—Showing a diffuse adenomyoma of the uterine body involving the entire walls.

may be hypertrophic or atrophied. It may show distinct crypts or even cystic hollows (see Figs. 159 and 160) dipping down into the muscle-tissue. Microscopically these invaginations may be traced for a variable distance into the walls of the uterus, or even as far as the peritoneum (see Plate XXV.). The invading mucous membrane consists of branching gland-tubules which have already been fully described. A very prominent feature is the cytogenous connective tissue which surrounds the glands. In appearance it resembles the stroma of the mucous membrane of the uterus, and gives the impression that all the component parts of the

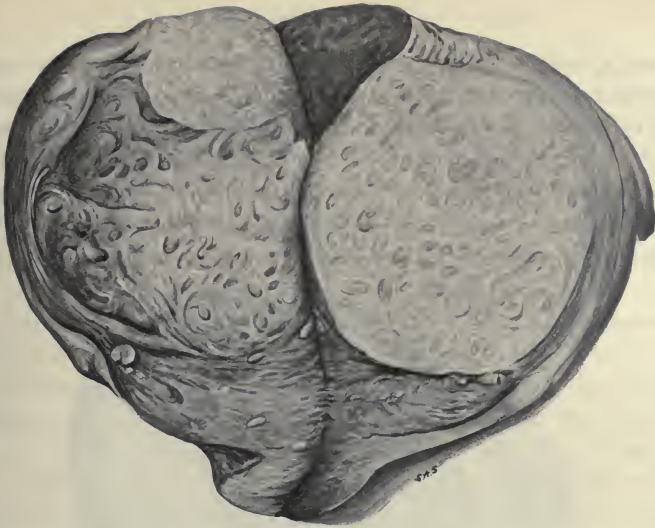


FIG. 158.—Showing an adenomyoma in the posterior wall of a uterus which has preserved its normal contour. The uterus has been opened from below.



FIG. 159.—Cystic adenomyoma in the septum of a uterus *septus*.

mucosa have a share in the invasion of the muscular wall. In the case of diffuse central 'tumours' this may be the actual fact, but there is room for some doubt as to whether the stroma of the mucosa does migrate or not. Another view worth considering is whether the epithelium of the mucous membrane is not the sole trespasser, and the muscular and connective-tissue hyperplasia are both of the nature of a responsive reaction to the irritation set up by the epithelial invader. If the latter view is adopted, we must regard the diffuse central adenomyoma of the uterus as

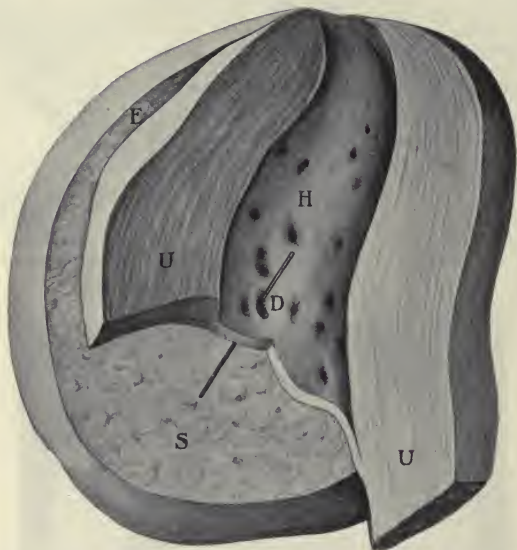


FIG. 160.—A round encapsulated tumour the size of a small fist situated in the postero-lateral wall of the uterus. It is being invaded by mucosal crypts. (Ribbert, *Geschwülste*, 1914.) H=cavity of uterus; D=mucosal crypt; U=divided anterior uterine wall; E.S.=adenomyoma of posterior and lateral walls.

an example of *adenomyositis*. It is a fact that in chronic metritis the glands of the mucosa dip farther into the underlying muscle than they do in a uterus which is normal, and this lends some support to the opinion now held by some observers that diffuse central adenomyoma is also inflammatory in origin, and not a true neoplasm in the common acceptance of that term.

(b) **Peripheral Uterine Adenomyomata.**—Like the above these 'growths' do not arise from the cervix, but only from the body of the uterus. They may be *large* or *small*; the majority are quite small, and present as sessile subperitoneal nodules. The site of election of the *small* nodules is at or near one or other cornu;

indeed, they may arise in the tube at its junction with the uterus (see Fig. 136, p. 305), or they may start in the uterus and implicate the interstitial part of the tube. Small nodules may present anywhere on the surface of the uterus as localised extensions of a central diffuse adenomyoma, just as the latter will sometimes project as a sessile submucous 'growth' into the cavity of the uterus. Sometimes small cystic nodules are found under the uterine peritoneum, in cases where there is a central diffuse growth as well, there being no traceable connection between the two. It is possible that many of these do not arise from the mucosa, but from the serosa of the uterus (see Figs. 146, 147, pp. 320, 321). In fact the etiology of the peripheral uterine adenomyomata is not nearly so simple as is that of the central tumour. In the latter the only outstanding question is as to whether they are inflammatory or not; that they are mucosal has been established by Cullen beyond all doubt. The large peripheral tumours are much rarer; the recorded cases show that they may become pedunculated, and that they may be situated at the cornu or near the internal os, they may lie free in the peritoneal space, or in the cellular tissues of the broad ligament. In the case of the latter and of those arising near the internal os, their origin has been traced to the uterine mucosa. The cornual ones have been regarded as of Wolffian origin.

II. Extra-Uterine Adenomyomata

(a) **The Fallopian Tube.**—'Adenomyoma' of the Fallopian tube presents as a nodular enlargement of the tube and often of the adjacent cornu uteri. The tube itself shows the usual signs of chronic salpingitis; it is sometimes thickened throughout its whole course, but not necessarily so. The tube is frequently adherent and matted to the ovary and adjacent structures. The nodular condition never forms a large tumour, but it may be large enough to open up the layers of the mesosalpinx at the tubal angle adjoining the uterus. The naked-eye appearances are those of a chronically inflamed tube, and again the diagnosis is a purely histological one. The salpingitis is commonly of tuberculous origin, but gonorrhoea and puerperal sepsis will also produce the same lesion. Microscopically the tubal mucosa is seen to invade the thickened muscular walls, and the continuity thus established between the lumen of the tube and hollow crypts or cystic gland-spaces in the muscle-wall leads to the possibility of the arrest of a fertilized ovum in such a space, and to the consequent production of interstitial tubal gestation.

The occurrence of these 'growths' in the Fallopian tube is the argument used by the supporters of the combined inflammatory and mucosal theories to over-

throw the hypotheses of von Recklinghausen (Wolffian) and of Kossmann (accessory Müllerian ducts).

The work of Chiari in 1887 has already been briefly mentioned. In 760 autopsies on the female he found nodular thickenings of the Fallopian tubes in six instances. Histological investigation led this observer to the conclusion that these swellings were the outcome of a chronic salpingitis, which he explained by stating that during an acute inflammation there was sufficient intratubal tension to force portions of the mucous membrane into the oedematous muscle-wall. The extruded portions

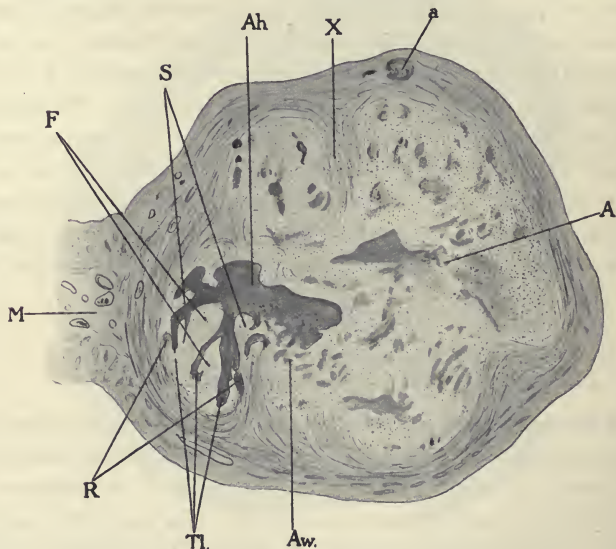


FIG. 161.—Fallopian tube injected by Höhne.

Tl. = injected lumen of tube with two large branching mucosal depressions. *R* = ring of invaded muscle-tissue. *Ah* = abscess cavity lined by heterotopic epithelium. *S* = ruptured muscle layer containing folds of heterotopic mucous membrane in its clefts. *F* = an abscess cavity which is in connection with the lumen. *Aw.* = injection spreading out in a diffuse manner in the tube-wall. *A* = larger abscess in the posterior and upper part of the tube-wall. *a* = peripheral section of the abscess tract. *X* = an incomplete septum consisting of uninvaded tubal muscle. *M* = mesosalpinx.

of mucosa retain at first their communication with the lumen, but later on they become isolated, and form the gland-spaces which are found in the wall of the tube.

These 'adenomata,' by setting up irritation, produce hypertrophy and hyperplasia of the muscle-tissue, and to this inflammatory histoid node the name of *salpingitis isthmica nodosa* was given by Chiari. This research was immediately supported by Martin (1887), Orthmann, Werth, Schauta, and was followed up by

researches by Opitz and von Franqué in 1900, E. Kehrler in 1901, Lubarsch (1902), Robert Meyer in 1903, and Höhne in 1905, who by injection of gelatin Berlin blue proved the connections between the lumen and the branching intramural tubules (see Fig. 161). Kroemer followed in 1906, then Maresch,¹ and finally an American investigator, Rabinovitz, in 1913.

The last writer, in speaking of von Recklinghausen's work, says that he (von

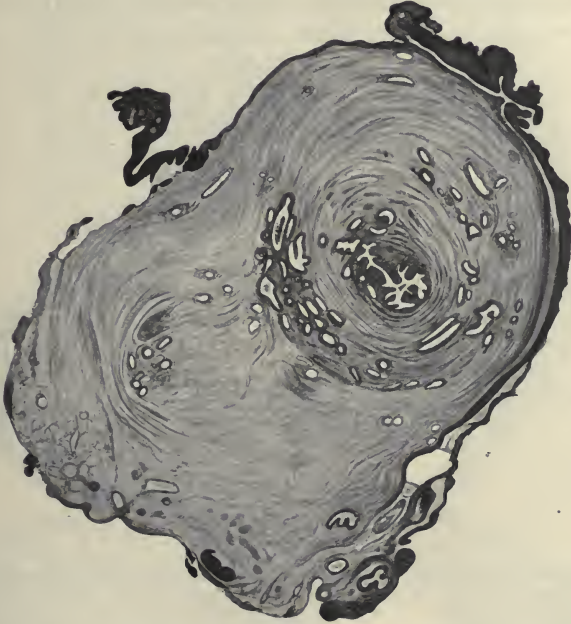


FIG. 162.—Showing salpingitis isthmica nodosa.

(After Otto v. Franqué, *Zeitschr. f. Geb. u. Gyn.* Bd. xlii., 1900, Taf. iii., Fig. 3, page 38.)

Recklinghausen) attempted to overthrow the inflammatory theory and enunciated the congenital origin of 'salpingitis nodosa.' It will be remembered that this was nine years after it had been introduced by Chiari (1896).

It was von Franqué's work and that of Opitz which brought back the prestige which the inflammatory theory had temporarily lost owing to the interest aroused by the hypothesis of von Recklinghausen. A comparison of von Franqué's drawing and those of Jacobs of *salpingitis isthmica nodosa* with that of von Recklinghausen's mesonephric tubal growth (see Figs. 162, 163, 164, 165, 166)

¹ *Diss. Berlin*, 1908.

will probably convince the reader that all the drawings illustrate one and the same thing—as R. Meyer once said when demonstrating an inflammatory tubal node: “This is von Recklinghausen’s Wolffian tumour.”

‘Adenomyoma’ of the tube is therefore better termed *adenomyositis tubae*, or as Rabinovitz terms it “adenomyo-salpingitis.” Rabinovitz could find no evidence of embryonic rests in ten cases examined.

(b) **Adenomyomata of the Round Ligament.**—In 1882 Säger collected 12 cases¹ of tumour of the round ligament; many of these were cystic, and were regarded

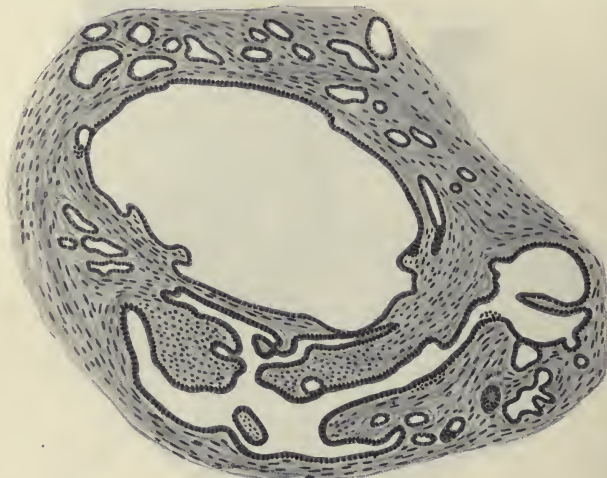


FIG. 163.—Section from a case of salpingitis isthmica nodosa showing a large cyst which has developed from the heterotopic mucosa. (After F. Jacob, *Beiträge z. Geb. u. Gyn.* Bd. xix. H. 1, Fig. 8.)

clinically as *hydrocele muliebris*, but on critical examination were found to belong to the class of embryonic swellings. Tumours occur in the three sections of the ligament, *i.e.* (1) between the uterine cornu and internal abdominal ring (intra-peritoneal); (2) in the canal of Nuck; (3) extraperitoneal, in the region of the mons Veneris. To these Säger added a fourth class, *i.e.* those parietal growths situated at a distance from the canal of Nuck. Säger had seen no example of the intracanalicular variety.

Some confusion has arisen between true growths of the round ligament and cystic swellings of the *processus vaginalis peritonei*, but in 1903 Emanuel had collected seventy-six true growths of the round ligament; fifteen of these were

¹ *Archiv f. Gynäk.* Bd. xxi.

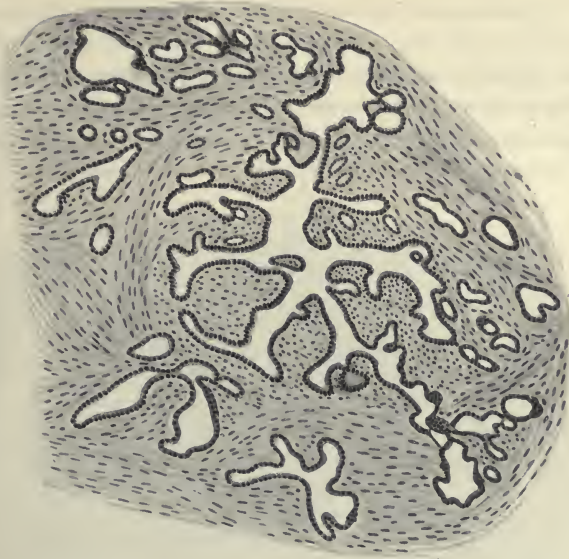


FIG. 164.—Section from a case of salpingitis isthmica nodosa, showing multiple ramifications of complicated mucosal diverticula which explain how easily an ectopic gestation might be caused in such a condition. (After F. Jacob, *Beiträge z. Geb. u. Gyn.* Bd. xix. H. 1, Fig. 9.)

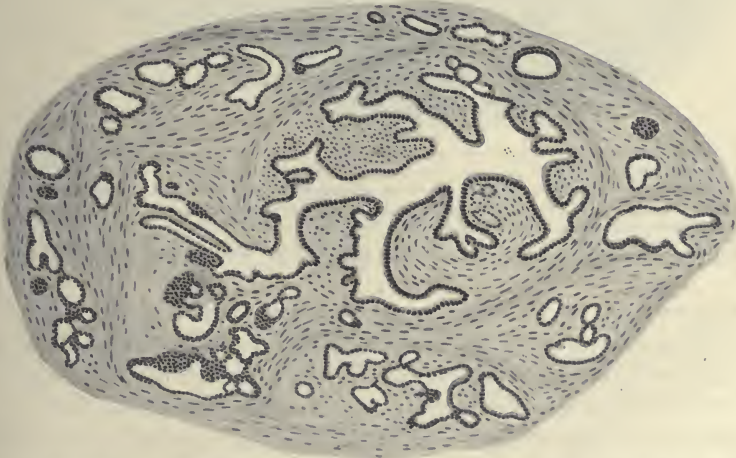


FIG. 165.—Section from a case of salpingitis isthmica nodosa, showing epithelial budding in some of the peripheral follicles. This is extremely common in tuberculous cases and may form the starting-point of a carcinoma. (After F. Jacob, *Beiträge z. Geb. u. Gyn.* Bd. xix. H. 1, Fig. 10.)

myomata or fibromyomata, and some proved to be 'adenomyomata.' To these he added four cases of his own. Emanuel's four cases contained cysts with cubical epithelium: he regarded the cubical *epithelium* as springing from endothelium, and preferred to look upon his specimens as examples of myoma lymphangiectodes rather than adenomyomata. The epithelial character of the cells lining the spaces was due to a change in the endothelium of the lymph-channels.



FIG. 166.—Section of Fallopian tube from a case of adenomyoma of both tubes. On the right side there was a hydrosalpinx. (After von Recklinghausen, who considered this to be an organoid growth formed around BT which he describes as the "tube.")

BT=tube with narrow lumen and thick mucosa. C=cyst lined with ciliated epithelium.

Adenomyomata of the round ligament appear to be three times as common in the extraperitoneal as in the intraperitoneal situation. Haematomata of the round ligament have, not infrequently, been reported; their origin is by no means determined. They are said to increase in size during menstruation, and by some authorities they are regarded as adenomyomata, in which haemorrhages have occurred during the monthly periods. Two such cases are mentioned by Emanuel as being extraperitoneal and one intraperitoneal. The last was the case of A. Martin, and is

quoted both by Cullen and Emanuel. It is of sufficient importance to receive further notice.

Martin¹ mentions that a patient aged seventy years came to him with a rapidly-growing tumour. On opening the abdomen he removed twelve litres of chocolate-coloured fluid from a tumour springing from the left round ligament.

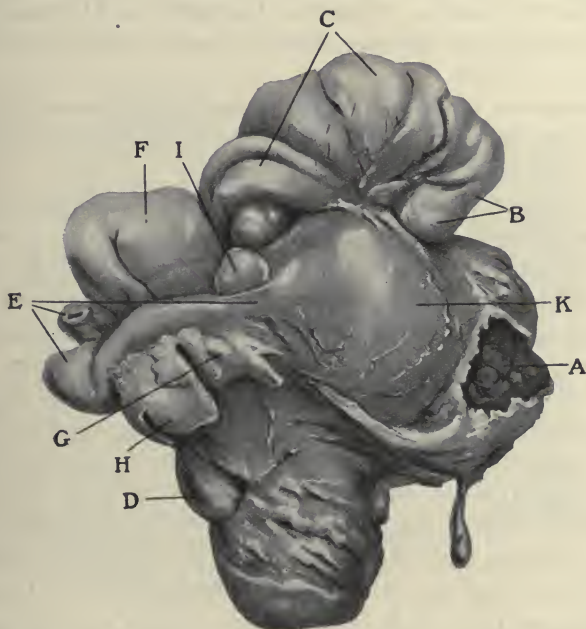


FIG. 167.—Cystic adenomyoma of the left side of the fundus uteri and cystic adenomyoma of the right ligamentum rotundum. (After Semmelink and de Josselin de Jong, *Monatsschr. f. Geb. u. Gyn.*, 1905, xxii. p. 234.)

A=cystic tumour of the left side of fundus uteri. B=left tube. C=left cystic ovary. D=adenomyomatous node between corpus uteri and cervix. E=right tube. F=right cystic ovary. G=right round ligament. H=cyst of right round ligament. I=solid round myoma in the fundus uteri. K=fundus uteri.

The growth was attached to the ligament by a definite pedicle. The pedicle contained several small cysts filled with clear fluid. One of these was lined by cylindrical epithelium. Cullen says: "It is quite probable that this was an adenomyoma of the round ligament situated nearer the uterine horn than usual. The process (of formation) appears to be analogous to the cystic development in

¹ *Zeitschr. f. Gyn.* Bd. xxii. S. 444.

subperitoneal or intraligamentary adenomyomata of the uterus." Emanuel hesitates to make a definite pronouncement on the nature of these haematomata, but Gottschalk, arguing from a hollow area in the pedicle of a blood-cyst, refers them to dilatations of the blood-vessels (telangiectasis).

Schramm¹ had an almost identical case, and from cystic spaces in the pedicle came to the same conclusion as Gottschalk. Lichtenstein and Hermann² had a case of this kind, excepting that here the blood-cyst became infected with the bacillus coli and an abscess formed.

Many other cases of cysts and cystic tumours occur in the records of the pathology of the round ligament, but it is difficult to arrive at just conclusions as to their etiology.

Although most cases of adenomyomata of the round ligament are extra-peritoneal, that of Martin mentioned above was intraperitoneal, so also was that of Ulesko-Stroganowa, who describes a tumour of *the uterine end* of the left round ligament the size of a fist. It was cystic, and its walls were composed of muscle and fibrous tissue; it was lined by ciliated epithelium; the author regarded her case as being certainly of mesonephric origin, and Vassmer agreed with her.

A remarkable case in which both round ligaments were the sites of cystic adenomyoma near their uterine ends is that of Semmelink and de Josselin de Jong. The case has been referred to before when dealing with the question of serosal adenomyomata. Figure 167 shows the anterior view of the entire specimen. The right round ligament (G and H) is the seat of a small cystic adenomyoma, and the large cyst A on the left side arose in the position of the left round ligament. It was separated from the uterine muscle by a sharp line of demarcation. It was lined by a mucous membrane 1 cm. thick, the characters of which are seen in Figure 168. Figure 169 shows the microscopic features of the small cyst in the right-sided tumour.

As in Martin's cyst which arose from the intraperitoneal or upper segment of the round ligament, the large cyst A was filled with a chocolate-coloured fluid. The authors considered that the adenomyomatous condition arose from Wolffian relics.

Origin of Adenomyomata of the Round Ligament.—Two important papers bearing on this point have been written by Fränkl and Elizabeth Weishaupt.

Fränkl regards round-ligament adenomyomata as mesonephric, and showed three models to demonstrate his proof. He states that the caudal pole of the Wolffian body presents a short duplicature—the plica inguino-mesonephrica: in its anterior

¹ "Ein neuer Fall von Haemat. lig. rot.," *Zeitschr. f. Gyn.*, 1896.

² "Zur Pathologie des rundes Mutterband," *Monatsschr. f. Geb.*, 1902.

border the round ligament develops. On the ventral and median surface of the Wolffian body the gland-tubules are developed and run as two folds, one towards the head, the other towards the tail end. At a later stage the caudal pole projects and becomes the plica inguinalis mesonephrica, and *in* this lies the round ligament. Müller's duct has not yet developed. The round ligament develops soon after the Wolffian body, and in the further growth of the embryo it is found in the region formerly occupied by the parenchyma of the Wolffian body. From such a close

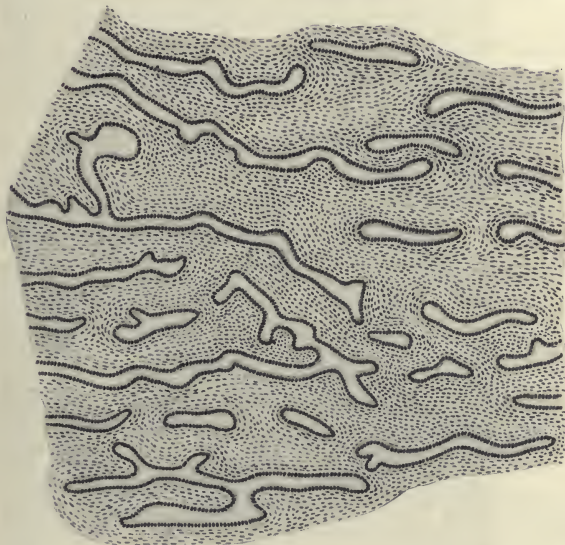


FIG. 168.—Section of the lining membrane of the left-sided fundal cyst (1 cm. in thickness). It was considered to belong to the left round ligament. (After Semmelink and de Josselin de Jong, *l.s.c.*)

relationship it was only likely that pathologically we should meet with traces of the Wolffian body in the round ligament. Fränkl went further and demonstrated reasons for his view that these growths stand in close relationship to distorted development of the uterus.¹

Weishaupt says these tumours are *not* due to embryonic remains. She takes the view of Robert Meyer as applied to all extraperitoneal adenomyomata, viz. that they are of serosal origin, the epithelium in the case of round-ligament tumours coming from the *processus vaginalis peritonei*.

Cullen (*l.s.c.*, p. 252), who will have nothing to do with the serosal theory, says the

¹ Fränkl, "Adenomyoma ligamenti rotundi bei uterus bicornis unicollis myomatosus," *Zeitschr. für Gyn.*, 1912.

controversy lies between the Wolffian and the Müllerian theories, and he favours the Müllerian origin for symptomatic reasons, *i.e.* enlargement during menstruation, and also from the fact that he regards the blood found in these growths as being



FIG. 169.—Adenomyoma of the right round ligament; see letter *G* in Fig. 167. The glandular growth has left a tongue of muscular tissue between the invading processes. (After Semmelink and de Josselin de Jong, *l.s.c.*)

menstrual. Personally, I am more impressed by arguments based upon developmental research than by those founded only upon symptomatology.

Clinical Aspect of Adenomyomata of the Round Ligament.—Extraperitoneal cystic growths will generally be diagnosed as hydrocele of the canal of Nuck. I made this mistake with a case of this kind, and only discovered its true nature microscopically when von Recklinghausen's pigment-bodies and other features put me

right. Intraperitoneal growths have been mistaken for ovarian cysts. Enterocoeles and epiploceles have to be differentiated.

The nodules grow slowly, as before stated. They are most likely to be first obtrusive in ripe sexual life. They may reach a considerable size, but are usually small. At first they cause no annoyance, but later become painful, especially during menstruation, when the lump increases in size. Microscopically, they are benign, and contain muscle, which a hydrocele sac does not. They should be removed if they cause pain.

(c) **Adenomyoma of the Ovarian Ligament.**—If, as Wieger says, this structure is the continuation upwards of the round ligament, *i.e.* if it is the lower portion of the fibro-muscular band which runs from the mesonephros to the cornu uteri and in its continuation forwards becomes the *ligamentum teres uterinum*, then we should expect it to behave in relation to neoplasms in the same way as does its distal part, the round ligament; but this supposition is not borne out by fact, adenomyomata being more common in the round ligament than in the utero-ovarian ligament. Probably trauma in the more exposed extraperitoneal situation of the round ligament affords some explanation for this.

Cullen's figure of one of these tumours is here reproduced. This tumour is described as an adenomyoma springing from the left utero-ovarian ligament; the figure shows it five-sixths the natural size (see Fig. 170). The naked-eye description reads as follows: "Perfectly independent from the uterus and attached to the utero-ovarian ligament on the left side is a myoma 6 cm. in length, 4 cm. in breadth, and 3 cm. in thickness. Projecting slightly from the surface are a subperitoneal cyst 1 cm. in diameter and numerous smaller ones. On making sections of the nodule we find in the lower part cystic spaces reaching 1.5 cm. in diameter. Sections through the middle portion show cystic spaces 1 mm., others 2 mm., and some 4 mm. in diameter. Sections through the attachment of the myoma to the utero-ovarian ligament reveal a cystic space 7 mm. in length and approximately 3 mm. broad. It has a definite yellowish lining and encloses chocolate-coloured contents. Several of the spaces are filled with a brownish, putty-like material and have yellowish margins. The ovary contains a cystadenoma." In Robert Meyer's case the uterus contained a myoma which extended between the layers of the left broad ligament. The Fallopian tube was elongated and stretched over it. The left ovary lay with its upper pole under the ampulla of the tube, whilst its lower pole was in contact with the intraligamentary portion of the myoma. The left ovarian ligament was 9 cm. long, it united the lower pole of the ovary to the uterus where it became flattened out and lost. At its distal end it had no connection with the myoma. The ligament was as thick as a man's finger;

it contained small cysts with red-brown contents, also a cystic canal $1\frac{1}{2}$ cm. in length. The epithelial cells were arranged in a single layer, the cells were cylindrical in the glands and low in the cyst. The whole of the thickened ligament was made up of this adenofibromatous tissue. Meyer first thought (1899) that the ovarian



FIG. 170.—Adenomyoma springing from the left utero-ovarian ligament. (After Cullen.) The uterine mucosa trespassed to some extent into the muscular wall. Cullen says: "It seems reasonably probable that the adenomyoma of the utero-ovarian ligament [here displayed] at one time lay next to the uterine mucosa, and that it gradually pushed outwards until it became subperitoneal and to all intents and purposes lost its continuity with the uterus." In my own opinion this is pushing the mucosal theory too far. The growth is much more likely to be of Wolffian or even of serosal origin.—C. L.

ligament could transport Müllerian 'germs' from the uterus into the Wolffian area. This in 1903 he said was wrong, and then concluded that the gland-spaces in this ligament were Wolffian.

Sitzenfrey¹ has described two cases of adenomyoma of the ovarian ligament. In the first case the gland-spaces ran from the hilum of the left ovary along the

¹ Sitzenfrey, *Zeitschr. f. Geb. Bde. lxxiv. and lxxvii.*

whole length of the enlarged ligament, to reach and penetrate the wall of the uterus (see Fig. 171). On the right side the ovarian ligament contained glands which ran into the uterine wall. Sitzenfrey regarded the gland-structures as Wolffian (epoöphoritic). This same author's second case was that of a tumour $7 \times 7.5 \times 5.25$ cm. in size which sprang from the posterior surface of the right ovarian ligament at its junction with the ovary (Fig. 172). The mass was rounded and irregularly lobulated. The growth was composed of canalized tortuous cords—a curious structure like that

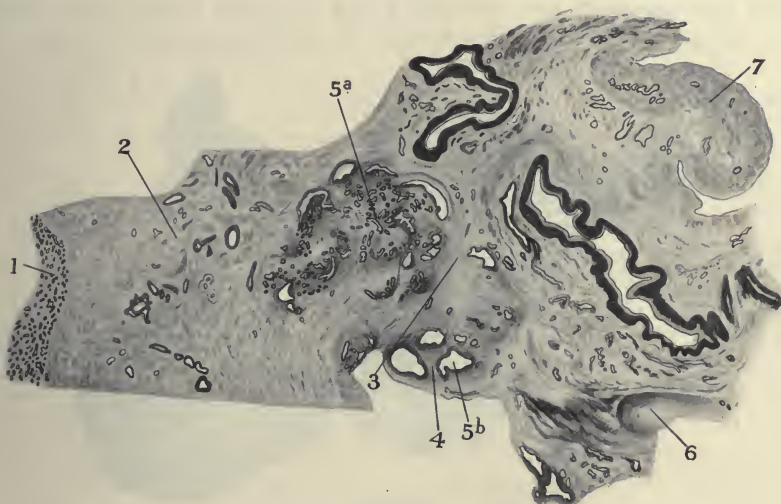


FIG. 171.—Transverse section through the left half of the corpus uteri and through the left ovarian ligament 2½ cm. underneath the insertion of the left Fallopian tube. (After Anton Sitzenfrey, *Zeitschr. f. Geb. u. Gyn.* Bd. lxiv. Fig. 10, p. 566, 1909.)

1=mucosa corporis uteri. 2=muscularis uteri. 3=thickened left ovarian ligament. 4=nodal swelling on posterior surface of ovarian ligament. 5a=adenomatous tissue in ovarian ligament. 5b=another collection of gland-tissue. 6=ovary. 7=round ligament. Between 6 and 7=mesosalpinx.

described by R. Meyer in his *Unknown Variety of Adenomyoma of the Uterus*. At the uterine end of the same ligament was a 'myoma,' the capsule of which also contained islands lined by ciliated epithelium.

In Oskar Fränkl's case the tumour showed an irregular arrangement of glands invested by a matrix of smooth muscle. The peripheral glands were wide, the central narrow. The glands coursed along the whole of the ligament and ran parallel to its long axis. A point of importance was the fact that *the glands did not penetrate either uterus or ovary*. There was a cytogenous mantle around the glands. Fränkl set himself the task of investigating whether this was a stationary

or an actively-growing process, and made a model by which he satisfied himself that it was a "*wachsendes Drusennest*." He then criticized both Meyer's and Sitzenfrey's cases, and pronounced two of the three at least to be definitely Wolffian. In discussing his own case he says the cytogenous mantle was of no diagnostic value in determining the origin of these growths. The genesis could only be settled by a careful study of the development of the ovarian ligament itself. Fränkl quotes Wieger's view (on which my opening remarks on this subject were based). Wieger found in embryos 10 cm. long, a cord which ran from the lower pole of the ovary in the long axis of the tube to the tubal angle, where it crossed the



FIG. 172.—Adenomyoma of the right ovarian ligament seen from behind.
(After Sitzenfrey, *Zeitschr. für Geb. u. Gyn.* Bd. lxvii., 1910.)

tube and then became bent at an angle of 120° , and continued its course onwards as the round ligament of the uterus. The portion between ovary and uterus corresponded later to the ligament of the ovary, and this together with the round ligament represented the *gubernaculum Hunteri*. Fränkl, on the other hand, states that the round ligament arises as a thickening of the caudal (later medial) border of the mesovarium (Mo. and L.ov. in Fig. 173), and has no genetic relationship whatever with the round ligament which arises as a thickening in the posterior wall of the processus vaginalis peritonei (ligamentum inguinale) (see Fig. 173, C). Fränkl considered that his case arose from that part of the Wolffian system found at the hilum of the ovary and known as medullary cords, whilst in the cases of Meyer and Sitzenfrey the tumours were from portions of the Wolffian duct. Clinically considered these tumours cannot be diagnosed from neoplasms of the ovary.

Adenomyomata of the Ovary.—Adenomyomatous elements within the substance of the ovary have been described by Cullen. I suppose these also should be referred to the epoöphoron.

The accompanying drawing (Fig. 174) showing adenomyoma of the hilum of the left ovary with a process of growth dipping into the ovarian stroma is from the

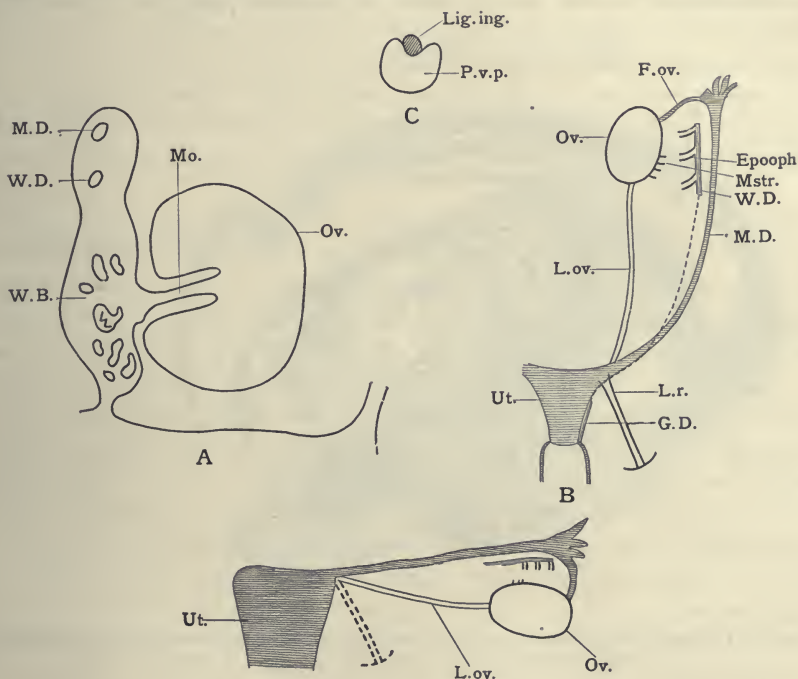


FIG. 173.—Diagrams (after Fränkl) relating to the development of the round ligament and ovarian ligament.

Mo. = mesovarium. *L.ov.* = ovarian ligament. *L.r.* = round ligament. *Lig.ing.* = inguinal ligament. *P.v.p.* = processus vaginalis peritonei. *M.D.* = Müller's duct. *W.D.* = Wolffian duct. *G.D.* = Gartner's duct. *Ov.* = ovary. *Ut.* = uterus.

case of Semmelink¹ and Josselin de Jong. This ovary was adherent to a uterine adenomyoma; its ligament contained no growth, so that it was an interesting speculation as to whence the tumour sprang. The author said that the structure was similar to that of the uterine stroma, but after discussing the mucosal, serosal, and Wolffian sources of origin he finally favoured the last on topographical, in preference to morphological grounds.

(d) **Adenomyomata of the Broad Ligament.**—One or two cases of adenomyomata have been described as arising in the broad ligament. For those who accept, as I do, the Wolffian theory for some adenomyomata there is no difficulty in understanding that they can arise from the epoöphoron within the folds of the mesosalpinx. Many of the growths which may have arisen in this way also implicated the uterus, and thus the genesis became a debatable point, but Robert Meyer

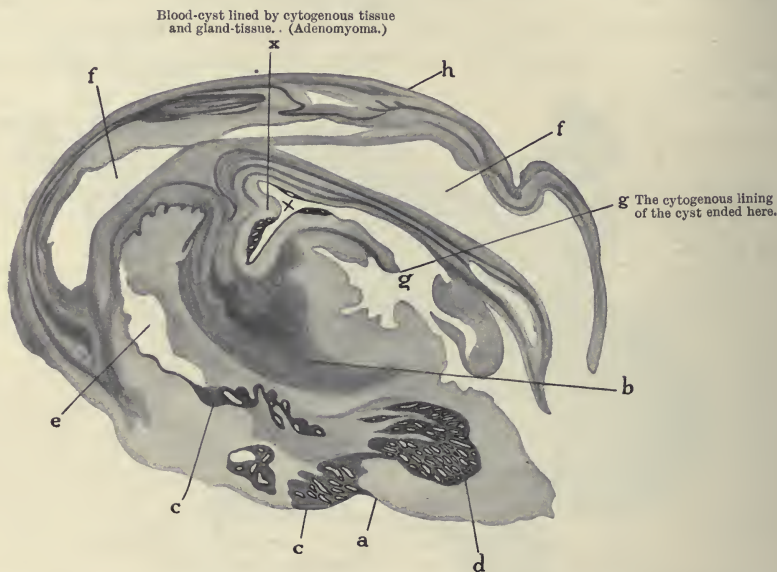


FIG. 174.—Left cystic ovary, showing invasion by an adenomyoma. (After Semmelink and de Josselin de Jong, *Monatsschr. f. Geb. u. Gyn.* Bd. xxii. Fig. 7, p. 244.)

a=hilum of ovary. *b*=ovarian stroma. *c*=adenomyomatous glands surrounded by cytogenous tissue (seen under a higher power). *d*=adenomyomatous tissue. *e*=large spaces which were filled with blood and into which the mouths of the adenomyomatous glands opened. *f, g*=other large spaces probably connected with *e*. *h*=external wall of ovarian cyst.

showed a *small* adenomyoma of the parametrium at the April meeting of the Berlin Obstetrical and Gynaecological Society 1908, which was traceable to the duct of Gartner.

L. Pick described a case of direct adenomyomatous formation in the epoöphoron by which he considered he had put the coping-stone on the proof of von Recklinghausen's theory. Pick found in the right *hilum ovarii* (where the epoöphoron lies) a tumour the size of a cherry which caused a bulging of the posterior leaf of the

mesosalpinx. The structure of this growth agreed with von Recklinghausen's description of principal canal, secreting and collecting tubules.¹

Jacobs² described his first of three cases as being a node the size of a cherry lying in the broad ligament. The node contained gland-spaces surrounded by a cytogenous mantle. The serosa was found to dip into the mass, and Jacobs considered that it was of peritoneal origin. Since Meyer's work on epithelial heterotopy became generally known, it is a striking fact that the theory of the serosal origin for adenomyomata has become more the vogue. Jacobs, however, has a very open mind, for of the other two cases described at the same time as the above serosal growth in the ligamentum latum, he attributes the second to "salpingitis nodosa of Maresch (inflammatory origin)," and the third to a "probable congenital Müllerian origin."

'Adenomyoma' is an infiltrative process, but is histologically benign. It is destructive only in so far as it alters the tissues invaded, but this it does in a totally different way from that of a malignant growth. But being infiltrative, it has the faculty of spreading into adjacent tissues at a distance from a given point of origin. Apply this propensity to the broad ligament and we find that this structure is not infrequently involved by the spread of 'adenomyoma.'

The commonest example is that of *adenomyositis* of the tube (see Otto von Franqué's drawing figured in this article, p. 335). If Leitch's view of his migratory adenomyoma is correct,³ then in his case there was a spread from the cervix along a narrow pedicle to a growth in the base of the left broad ligament. This view is not out of harmony with an inflammatory genesis, for the predominant mass might have been a nodular parametritis which was being absorbed on the pelvic and uterine (outer and inner) aspects, thereby leaving a median lump into which inclusions of epithelium passed along the old inflammatory tract from an injured cervix. Epithelial heterotopy is particularly common in the cervix, as instanced by the covering over of an inflamed area by the columnar epithelium derived from the canal or the glands in cases of so-called *erosion*; and if a cervix be sufficiently injured and infected to produce a parametritis, the resulting reparative epithelial heterotopy may exceed its function and start the adenomatous growth within the parametric exudate.

There are therefore two distinct ways in which the broad ligaments may become the seat of adenomyomata.

¹ L. Pick, "Ist das Vorhandensein der Adenomyome des Epoöphoron erwiesen?" *Centr. f. Gyn.* No. 15, 1900.

² *Beitr. zur Geb.*, 1913, Bd. xix, H. 1, S. 143.

³ *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, July 1914.

1. By the growth arising *in situ* from foetal relics (epoöphoron and Gartner's duct).
2. By extension of an inflammatory process *plus* epithelial heterotopy from an adjoining structure.

There is yet a third method. Uterine adenomyomata have been described in which the tissues have become so excessively cystic that, by fusion, large cysts have formed, which have reached out laterally into the broad ligament, whilst preserving their connection with the uterus in the form of a canalized isthmus. Other cases are mentioned in which the growth, though solid, has done the same thing, *i.e.* opened up the leaves of the broad ligament, just as (as Cullen says) an intramural myoma is liable to do. In tumours of this kind Cullen tells us he has been able to trace the continuity of the mucous membrane. Thus the mucosal, foetal, and serosal 'growths' may all find representatives within the folds of the broad ligaments.

The sites of election within the ligaments will obviously be at the top and at the bottom, *i.e.* (1) in the mesosalpinx (salpingitis and epoöphoron), (2) in the cellular tissues around Mackenrodt's cervical ligaments (parametritis). The latter situation is frequently involved by a lateral spread of a process which has started in the recto-vaginal septum.

(e) **Adenomyoma of the Recto-Genital Space.**—This is a condition with which individual British gynaecologists have long been familiar, but which, as yet, has never been mentioned in any English work on gynaecology. The majority of cases appear as small nodules, found on vaginal examination to lie behind the cervix and just above the posterior vaginal fornix; the term "fornix adenomyomata" has been applied to these small growths by some observers. The reason that these growths are generally small is perhaps to be seen in the fact that they are painful, especially during coitus, this leading to early detection in the case of married women. Many cases are now on record where the extent of the tumour is relatively great, *i.e.* where it has spread so as to implicate deeply the rectum and adjoining cellular tissues of the broad ligament, especially on the left side. The condition then assumes the physical signs of a posterior parametritis. In such cases there is no definite outline to the mass, the cervix is fixed posteriorly, the mucous membrane of the posterior vaginal wall is puckered and sometimes so far invaded by the 'growth' as to cause a haemorrhagic papilliferous surface in the posterior vaginal fornix.

The rectal invasion has never been shown to implicate the mucous surface. The mucous membrane of the rectum feels normal and can be moved over the mass invading the muscle and submucosa, so that whilst we have vaginal haemorrhage as a symptom of ulceration through the mucosa of the vagina, rectal haemorrhage

has not been found to occur. There is a tendency, however, towards stenosis of the rectum, and before this occurs a leading symptom is obstinate constipation and dyschesia. London experience seems to indicate that these cases are more likely to be discovered by those surgeons who are dealing with rectal diseases than by those who are engaged in gynaecological work. Very many cases of diffuse adenomyomata of the recto-genital space have been regarded as carcinoma recti and treated as such. For further consideration of this question see diagnosis, p. 382, and treatment, p. 383.

The literature on this condition is already quite extensive, and it is now sufficiently well recognized to prevent the error of treating it (adenomyoma of the recto-genital space) as a malignant process—an error which more than one operator excusably made before the truly benign character of an infiltrating adenomyoma was properly understood. L. Pick, in speaking of the diffuse character of adenomyomata of the vaginal fornix, said that they gave the idea of a malignant growth, but he subsequently speaks of the condition as being benign throughout.

The question of how to deal with the rectum was made the subject of public discussion by Füh, and the conclusion was that although a radical operation might prove "simple," the patients get well without it (*i.e.* if a portion is left behind).

In *Fibroids and Allied Tumours*¹ I have given a summary of over forty cases of these 'tumours' occurring in the recto-genital septum. Space does not permit of including an account of all these cases in this article, but some of the most important are given.

A large proportion of the recorded cases relate only to small growths. These came under observation for various reasons, some because they were painful, especially on coitus, others because they were associated with dysmenorrhœa. A few were discovered accidentally whilst operating for large myomata, for carcinoma of the cervix, for ovarian abscess and double pyosalpinx. In the case of the larger, more diffuse, and infiltrating masses, the most obtrusive symptom, as might be expected, was connected with difficulty in defaecation. This varied from constipation and dyschesia to acute signs of obstruction, such as meteorism, sickness, and the like—symptoms, in fact, which strongly suggested the presence of cancer of the lower bowel. Another reason for discovery in the advanced stage was vaginal ulceration leading to septic blood-stained discharge. Only one case has been put on record as malignant, and this was not a large growth. I am personally doubtful as to the malignancy in this solitary instance, but have included it under the section dealing with adenomyomata in relation to malignancy.

¹ Cuthbert Lockyer, *Fibroids and Allied Tumours*. Macmillan & Co., 1917.

The question as to the source of the epithelium in adenomyomata of the recto-genital space has given rise to a great diversity of opinion. Favouring an origin from the Wolffian system we have Pick, Pfannenstiel, von Herff, Schickele, Louis Bazy, and Moraller (von Hausemann), whilst FÜth, Kleinhans, Schwab, Bortkiewitsch, and Cullen are of opinion that the Müllerian system supplies the gland-elements. Finally, Meyer, Raspini, Sitzenfrey, Amann, and Renisch support the serosal theory.

The prevailing view at the present time, to judge from the most recent articles written on the subject, is to regard adenomyoma of the recto-genital space as an inflammatory product and not a true neoplasm. We find authors using terms to designate the condition such as "pelveo-peritonitis," "adenomyositis" (Bortkiewitsch), "parametritis nodosa posterior" and "parametritis diffusa" (Meyer), "adenomyositis recti" (Sitzenfrey), "adenomyositis uteri et recti" (Raspini), "chronic inflammation with serosal inclusions" (Renisch).

Meyer is an upholder of the inflammatory and serosal theories. He bases his argument on the fact that the masses he has examined are diffuse and non-circumscribed (and therefore inflammatory). Meyer also states that the condition is always associated with perimetric adhesions. I cannot accept the universality of Meyer's views, because adhesions are *not* always present. They were absent in my own case, for which I resected the rectum and removed bowel and uterus *en masse*. Moreover, cases are on record where the tumour was "shelled out," and where a capsule has been described.

A critical review of all the published cases has convinced me that the etiology of these curiously situated 'tumours' varies. I am quite prepared to accept the inflammatory and serosal theory for many, or I may say most of the cases, but it does not seem applicable to all. It is quite clear that the mucosa of the bowel takes no share in the formation of these growths. A few typical cases are appended.

1. H. FÜth in 1903 published the case of Ouren of Trondhjem in Norway. The patient was a nullipara aged thirty-two. The symptoms had lasted for five years. The posterior vaginal vault was depressed, and there was an ulcerated surface the size of a half-a-crown on the posterior vaginal wall, extending nearly to the external os. Behind the cervix and uterus was a fixed growth the size of a fist, which extended on the right to the pelvic wall. On the left it projected only slightly beyond the cervix. The rectal mucosa could be moved over the growth. A malignant tumour, probably ovarian, was diagnosed. FÜth removed the growth by Wertheim's total hysterectomy on August 9, 1902. The rectum was not resected (see Fig. 175), and when the patient left hospital a hard thick mass was felt fixed to the rectum and side of the pelvis. A year and a half later the patient was in good health. The growth had no continuity with the uterine mucosa, but FÜth considered that it was Müllerian for symptomatic reasons, *i.e.* he adopts the same reasoning as does Cullen.

2. In Kleinhaus's case the patient was a primipara aged forty-four years. There had been a brownish vaginal discharge for nine months. The periods were regular and lasted four to ten days, profuse but *painless*. In the posterior fornix was a papilliferous growth (Figs. 176 and 177) emitting a brown secretion. The neighbouring vaginal wall was thickened, uterus normal in shape, but enlarged. Douglas's pouch was pushed up by a thick mass very clearly felt *per rectum*. Wertheim's hysterectomy was performed on March 10, 1903. The rectum and cervix were fused together by an intervening mass which also elevated the peritoneum. This paracervical induration did not prevent the separation from the rectum being carried out by "blunt dissection." Examination of the patient on leaving hospital revealed a thickening at the point of separation of the growth. The drawing (Fig. 178) gives a clear indication of how the papilliferous vaginal surface was produced, and Figure 179 shows the growth invading the submucosa but not reaching the mucosa of the rectum. Kleinhaus regarded this infiltrating growth as arising from the "vaginal glands," *i.e.* parts of Müller's ducts.

3. Of Sitzenfrey's four cases I here give details of the second which was that of a *diffuse infiltration* between rectum and uterus (see Fig. 180). Between this and a distinct tumour-formation the author says every gradation was to be found.

The patient was aged forty-two years. The periods were profuse, but *painless*. The symptoms were a sense of pressure in the rectum and occasional dysuria.

Examination.—Patient nullipara, slender. Smooth, mobile tumour rising up out of pelvis to three finger-breadths from navel. Cervix continuous with tumour; posteriorly was an uneven knotty growth uniting it to the rectum.

Operation November 11, 1908. Lumbar puncture (von Franqué). Pfannenstiel's incision. Total extirpation. Posterior vaginal wall dissected off rectum cautiously from below upwards. Patient left hospital in seventeen days.

The large abdominal tumour was a degenerated 'fibroid.' The recto-vaginal infiltration showed the gland-inclusions extending into cervix and rectum. The left ovarian ligament was also the seat of an adenomyomatous growth (see p. 346). Although the rectum was not resected, there was no trace of growth in the bowel-wall when the patient was discharged from hospital. Sitzenfrey regarded this as an example of *adenomyositis recti*.

4. Hermann Renisch published an important case (strikingly similar to my own) of very



FIG. 175.—Adenomyoma of recto-vaginal septum. (After Füh, *Zent. für Gyn. i.*, 1913.)

extensive "Adenomyositis uteri et recti." Renisch mentions that in most of the cases hitherto published the tumours were small, although some had involved the rectum; they had generally been regarded as Wolffian in origin, and Pick had spoken of the recto-genital space as the "typische Localization," and as the "Lieblingssitz" for these mesonephric growths, saying that they certainly arose from the paroöphoral section of the Wolffian system.

Renisch's case was that of a woman aged thirty-one years. Married two years, no



FIGS. 176 and 177.—Kleinhans' case of adenomyoma of the recto-genital space.
(Taf. 4², Taf. 5⁵, *Zeitschr. f. Geb. u. Gyn.* Bd. lii.)

Fig. 176 represents a sagittal section through the uterus; it shows the growth projecting as a papilliferous mass into the posterior vaginal fornix. Fig. 177 shows the cervix and adjacent posterior vaginal surface, with the surface of the growth seen on the flat.

conception. Menstruation started at sixteen years; regular, four-weekly, three to four days; *painless*. For six months profuse periods every three weeks, lasting eight days with *acute sacralgia*. Then followed frequent attacks of straining at stool.

Examination.—A slender middle-sized woman, well nourished; the cervix was forward, corpus anteflexed, and not enlarged. *In the posterior fornix was a hard tender lump the size of an apple*. It was fixed to the intact vaginal wall and to the rectum. The parametrium on both sides was infiltrated. The adnexa were not palpable. The diagnosis of a malignant neoplasm was made. Total abdominal hysterectomy by Amann, October 8, 1909.

The whole of the back of the normal-sized uterus was adherent to the rectum. The separation of adhesions was easy until the cervix was reached, but this was immovably

fixed to the rectum, and further blunt dissection was impossible (see Fig. 181). As the rectal wall was thick and infiltrated, a portion the size of a crown piece was resected from the anterior wall and the wound closed. Drainage above and below. Healing perfect without fistula. Discharged in three weeks.

The width of the resected portion of bowel measured $5 \times 4 \times 2$ cm. The growth was not absolutely median, but slightly to the left side (as in my own case). There were no myomata in the uterus. The tumour itself measured $2 \times 2 \times 3$ cm. Its fibrous ground-substance radiated towards vagina, rectum, and cervix. Between the fibres were irregular brownish-red pigmented spots; especially towards the vagina. In the hyperplastic uterine wall (which was 1.5 cm. thick) were cysts filled with numerous small and large dark red-brown crumbling masses.

Microscopically, the cystic spaces ran irregularly, and only slightly followed the blood- and lymph-vessels. They fused to form a network of gland-spaces.



FIG. 179.—Section through the rectal wall in Kleinhans' case. The dotted line embraces a "single-file" process extending from the main growth through the submucosa towards the mucous membrane of the bowel. (Kleinhans, *l.s.c.*)

The case will be again referred to under "malignancy" (see p. 371).

6. My own case was that of a sterile married woman, aged thirty-five years, whose symptoms were obstinate constipation, pain, and menorrhagia. There was a curious hard



FIG. 178.—Section through the papilliferous processes in the vaginal wall. Note that the glands appear to be arising from the basal layer of the squamous epithelium at the apices of the two papillae. (Kleinhans, *l.s.c.*)

to form a network of gland-spaces.

Towards the serosa and cervix were mostly single spaces; towards the vagina and rectum the glands were more branched and larger. For the most part the glands were invested by a cellular-tissue mantle. The single-file arrangement was well marked above the vaginal surface (as in my case). The "double comb" form is never found in these chronic inflammatory cases. The inclusions came from the serosa (see Figs. 181 and 182).

5. Max Schwab recorded a case of multiple adenomyomata of the uterus undergoing "carcinomatous degeneration." The largest growth was retro-cervical. Its position is shown in the author's diagram (Fig. 183). It is a contrast to the foregoing cases because it was like an encapsulated hen's egg.

mass in the posterior vaginal fornix, which was fixed to the cervix and to the rectum. The posterior vaginal wall was puckered and presented bluish petechial spots which did not bleed on contact. The appendages were normal, there were no peritoneal adhesions. The left ureter was involved in the growth and suffered injury. A large segment of rectum was removed *en masse* with the uterus (see Fig. 184). The cervical wall and that of the rectum were both deeply infiltrated by the growth (see Figs. 185, 186, 187, and Plate XXVI.).

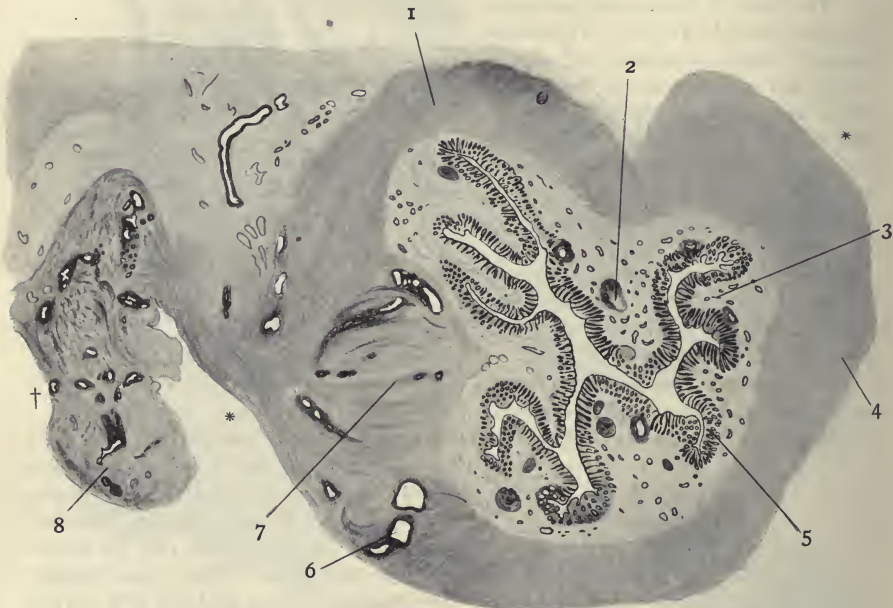


FIG. 180.—Section through an adenomyoma of the recto-vaginal septum. (After Sitzenfrey, *Zeitschr. für Geb. u. Gyn.* Bd. lxiv. Fig. 6, p. 554.)

1=circular muscle of rectal wall. 2=follicle of adenomyoma. 3=submucosa. 4=longitudinal layer of muscle. 5=rectal mucosa. 6=penetrating glands. 7=follicle of adenomyoma in anterior wall of rectum. 8=posterior wall of cervix. *=position of meso-rectum. †=Growth in posterior wall of cervix.

The patient increased in weight rapidly after operation, but developed a urinary fistula from the injured left ureter, none of the urine from the left kidney entering the bladder. I thought I was dealing with an infiltrating malignant growth, and the trouble with the left ureter supported this view. *Post hoc*, the ureteric complication leads me to favour the inflammatory theory as an explanation of this case.

7. Cullen has had two cases of adenomyoma of the recto-vaginal septum. In the first the uterus was retroposed and the rectum was adherent to the uterus low down. Total hysterectomy was performed, and a myoma 1 cm. in diameter was shelled out from the left side of the pelvic floor, also another tumour 4 cm. in diameter with a secondary nodule

projecting from its surface. Cullen's drawing shows the uterus not retroposed, but anteverted. The situation of the "combined nodule" is seen in Figure 188.

The second case is described by Cullen as an adenomyoma in the left broad ligament, intimately blended with the uterus. The patient was aged thirty-seven years. Two years previously a myomatous uterus and enlarged ovaries were removed. At that time a small portion of the rectum was removed also on account of adhesions. Post-operative intestinal obstruction intervened. Cullen found a thickening behind the cervix and *induration* in both broad ligaments. In the left broad ligament was a cystic mass 6 cm. in diameter

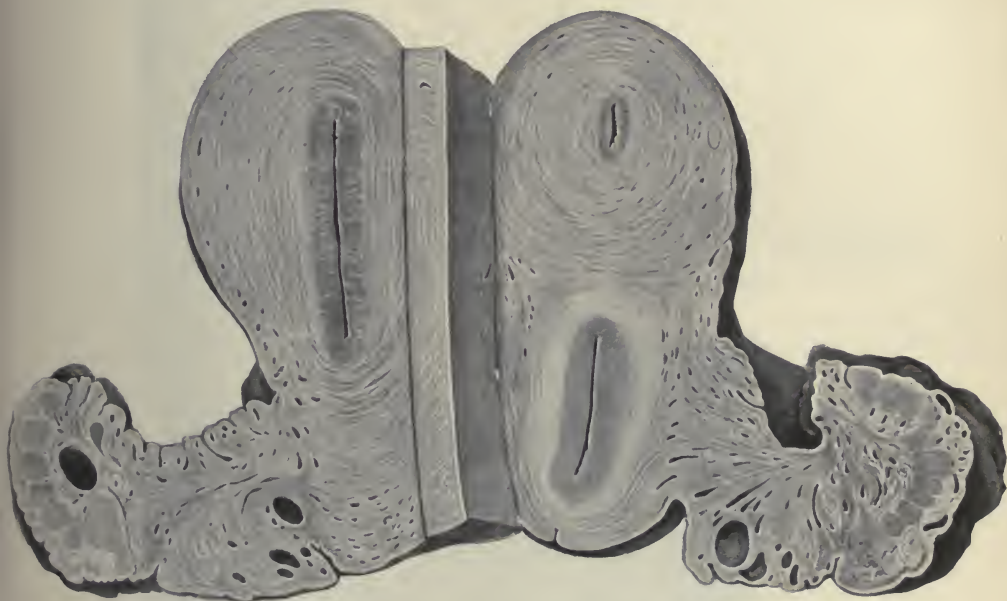


FIG. 181.—Adenomyoma of the recto-genital space, showing the growth adherent to the entire posterior wall of the cervix and to a portion of the rectum. (After Hermann Renisch, *Zeitschr. für Geb. u. Gyn.* Bd. lxx., 1912.)

(see Fig. 189), a portion of which had to be left adherent to the rectum, as the patient's condition was serious. The right broad ligament was not explored. The cyst contained chocolate-coloured fluid. The more solid parts were made up of smooth muscle-fibres and "quantities of *uterine* glands embedded in their characteristic stroma." Cullen's view of the nature of this growth was that it originated in the cervix. From the clinical history of this case I should say it is an example of the inflammatory type, *i.e.* a case of cystic adenomyositis.

The following are Cullen's comments on the treatment of these "masses":

"When the growth has invaded the rectum to a limited extent it is necessary to remove only a small portion of the anterior wall of the rectum."

"When the rectal involvement is extensive, as in Lockyer's Case II., resection of that portion of the bowel will, as a rule, be necessary."

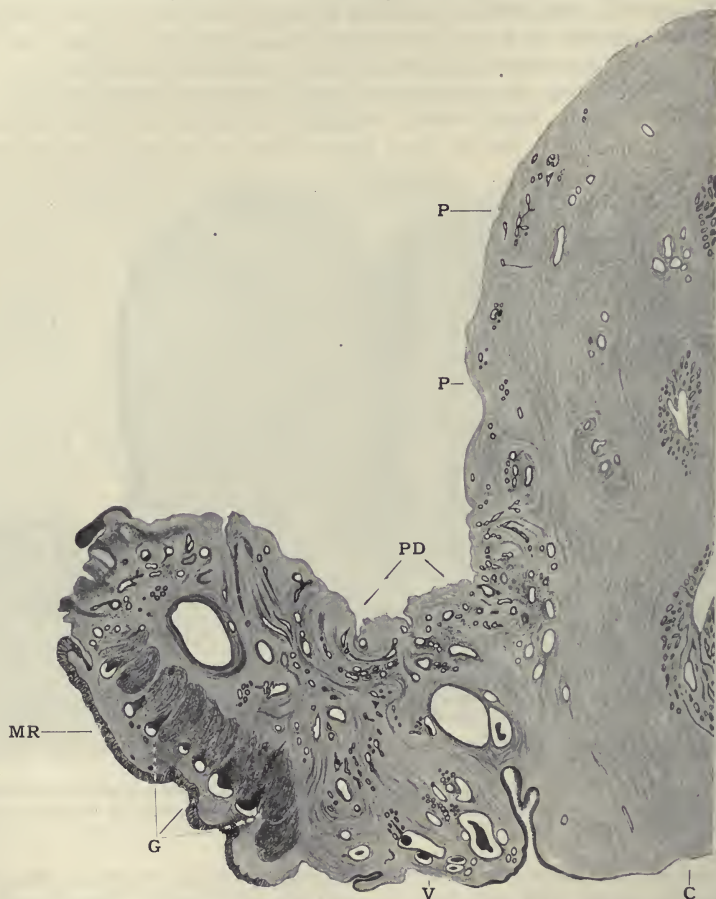


FIG. 182.—Adenomyoma of the recto-genital space. An enlargement of Fig. 181. (After Renisch, *l.s.c.*)

C=cervix. *V*=posterior vaginal wall. *G*=growth in muscle and submucosa of rectum. *MR*=mucous membrane of rectum. *PD*=peritoneum of Douglas's pouch. *P*=peritoneum of posterior uterine wall. *N.B.*—The glands were considered by Renisch to represent inclusions of the peritoneum.

On the question of diagnosis this author writes :

"The differentiation between carcinoma of the bowel and adenomyomas of the recto-vaginal septum is important. If the uterus contains myomas the probability that the pelvic growth is an adenomyoma is strengthened. If the growth is cystic the diagnosis of adenomyoma is almost certain."

"The only rectal symptom is painful defaecation or obstructive symptoms."
 "If portions be left these will continue to grow."

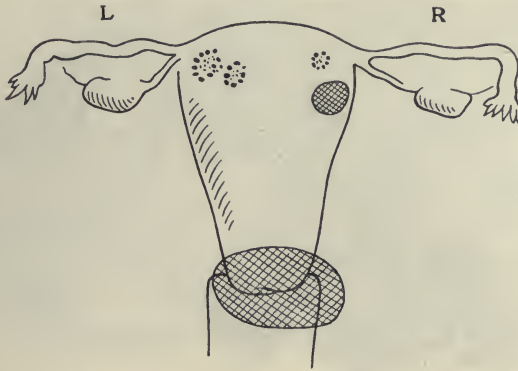


FIG. 183.—Scheme of uterus as seen from behind, showing situation of retro-uterine and uterine adenomyomata. Tumours in the anterior uterine wall are represented by points. Those in the posterior uterine wall are represented by cross lines.

(After Max Schwab, *Beiträge zur Geb. u. Gynäk.* Bd. xii. S. 105, 1908.)

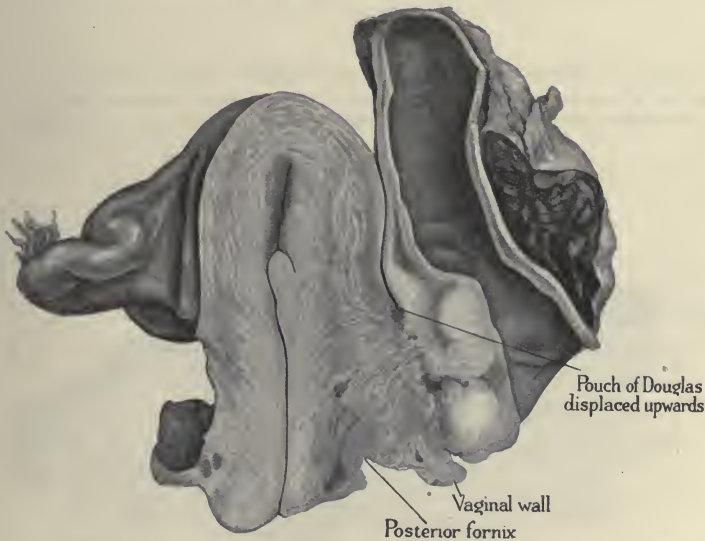


FIG. 184.—Author's second case of adenomyoma of the recto-genital space. Naked-eye view of sagittal section.

"The glands from these growths undoubtedly arise from the uterine mucosa or from remnants of Müller's duct."

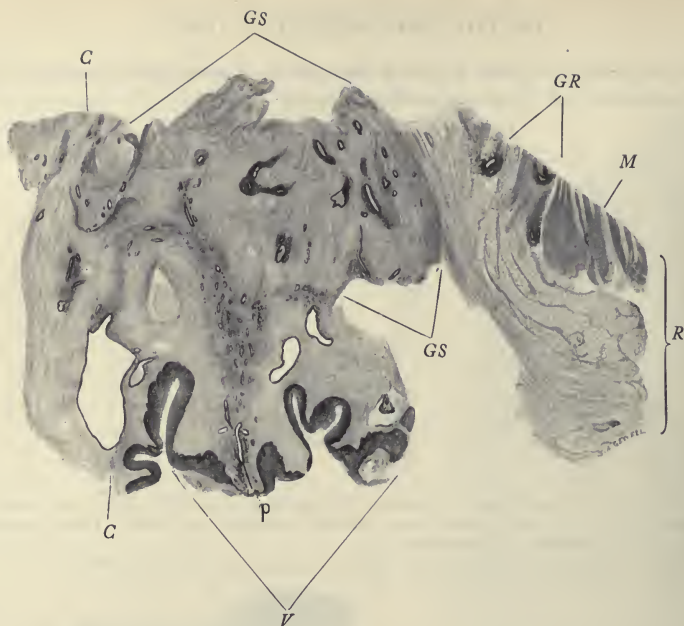


FIG. 185.—Section through adenomyomatous 'growth' seen in Fig. 184 ($\times 6$).

C=portion of cervix. *V*=posterior vaginal wall. *GS*='growth' in septum between cervix and rectum. *M*=muscle tissue of rectum. *GR*='growth' in muscle wall of rectum. *R*=rectum.

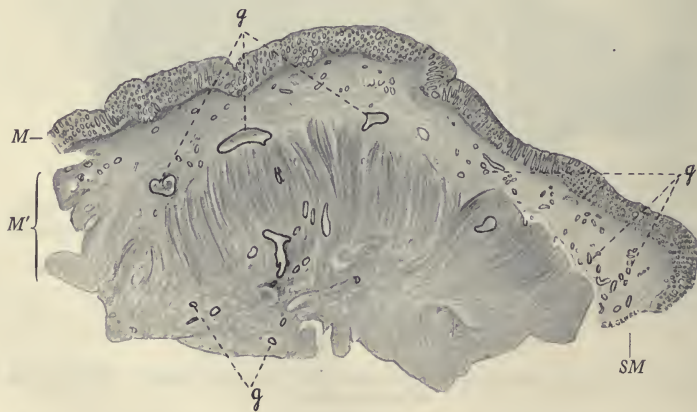
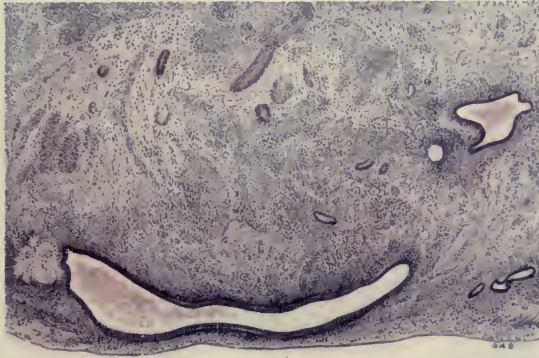


FIG. 186.—Section through the rectal portion of 'growth' seen in Fig. 184 ($\times 6$).

M=mucosa. *SM*=submucosa. *M'*=muscle layers. *g*=gland-tubules of 'growth.'

PLATE XXVI. Vol. II

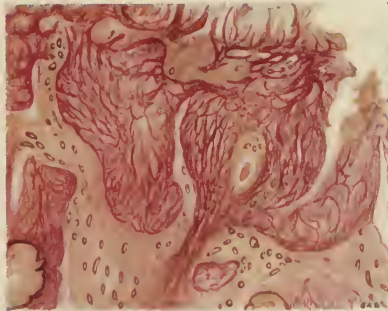
A



Microscopic section of a cornual adenomyoma which was diagnosed by the late J. H. Targett and myself as nodular tuberculous salpingitis. The situation of the growth is shown in Fig. 156, page 328. The section was taken at point marked S in Fig. 156.

$\frac{3}{8}$ in. obj. 2 eyepiece.

B



Section of rectal portion of an adenomyoma of the recto-genital space, stained by Van Gieson's method. The growth is coloured yellow, and is seen invading the circular muscular layer, the fibrous tissue of which is stained pink.

2 in. obj. 2 eyepiece.

Rectal mucosa

New growth in rectal muscle

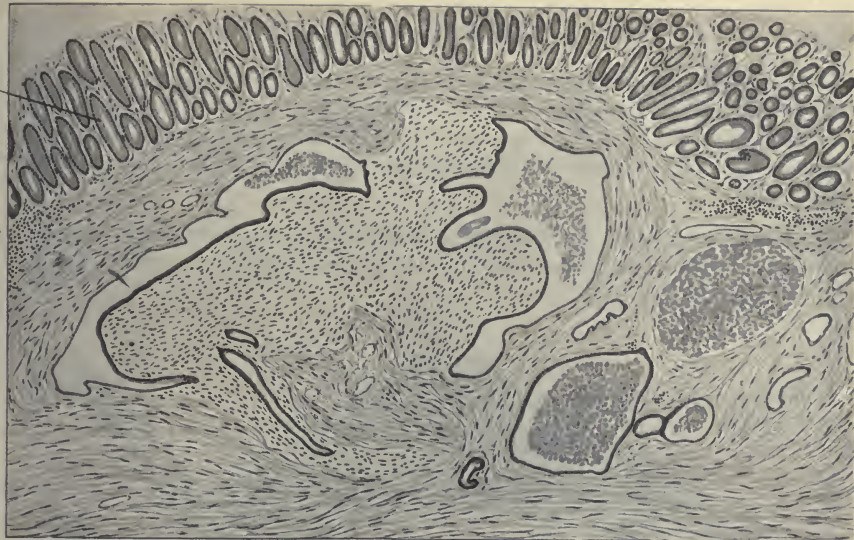


FIG. 187.—Section through the rectal portion of 'growth' seen in Fig. 184, showing the cystic character of the tubules and the freedom of the mucosa from invasion.



FIG. 188.—Situation of adenomyoma in Cullen's case shown diagrammatically.
(After Cullen, *Journ. Amer. Med. Assoc.*, March 14, 1914, Fig. 3, page 837.)

It will be seen that Cullen differs widely from other authorities both as to treatment of the bowel and as to etiology.

In my opinion it is no doubt best in cases of uncertain diagnosis to remove a portion of the growth *per vaginam* for microscopic examination, whenever the mass is sufficiently accessible.

(f) **Adenomyoma of the Alimentary Tract.**—For a discussion on this condition the reader is referred to the author's monograph, *Fibroids and Allied Tumours*, 1917, pp. 371-378.

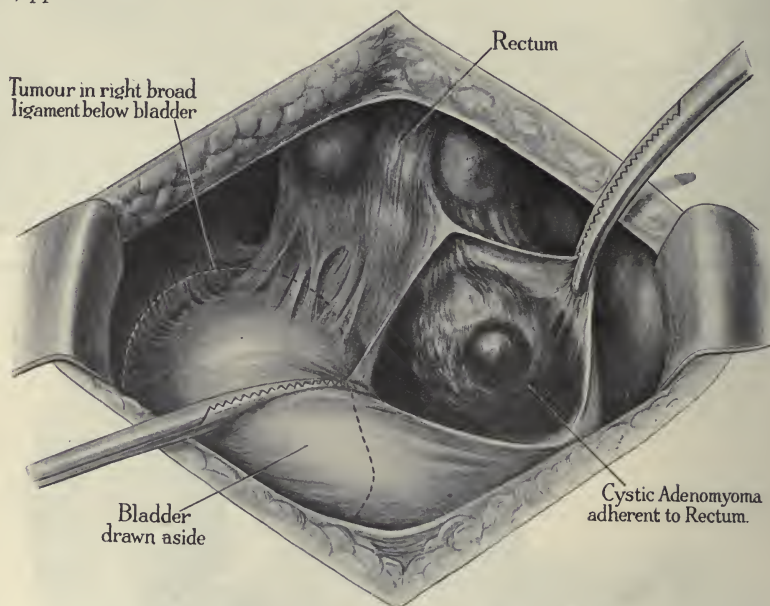


FIG. 189.—Cullen's cystic adenomyoma adherent to the rectum. The uterus had been previously removed. (After Cullen, *Journ. Amer. Med. Assoc.*, March 14, 1914, Fig. 5, p. 838.)

(g) **Adenomyoma of the Umbilicus.**—The views of Cullen on this subject will be found in his book, *The Umbilicus and its Diseases*, 1916, pp. 373-399.

ADENOMYOMATA AND PREGNANCY

This is a subject of considerable clinical importance, because, whatever view is taken as regards the etiology of adenomyomatous growths, there is abundant evidence to show that the gland-spaces communicate with the lumen of the Fallopian tubes and with the cavity of the uterus. Micholitsch of Vienna and Hellier of Leeds have drawn

attention to the association between ectopic pregnancy and tubal 'adenomyomata.' A fertilized ovum is liable at the tubal angle to stray into one of the communicating channels between the lumen and the interstices of the growth, and so to develop in the muscularis. The same thing applies to uterine adenomyomata which have become intraligamentary and cystic; these have preserved their connection with the uterus by means of an open channel large enough to allow a fertilized ovum to pass.

An interesting histological feature seen in adenomyomata during pregnancy is the fact that in some instances, but not in all, the 'cytogenous tissue' around the



FIG. 190.—A case of 'adenomyoma' of the cornu uteri with unruptured tubal gestation.
(After Cullen's Fig. 66, p. 247.)

A = unruptured tubal gestation-sac. M = myoma. The adenomyoma is on the opposite side to the tubal pregnancy.

gland-follicles takes on decidual reaction. Cullen mentions two instances in which this occurred, and he sees in the decidual change a "further proof that these *islands of mucosa* are identical with the normal uterine mucosa."

Mention has already been made of the case in which Whitridge Williams, on examining the uterus of a patient entering hospital in a desperate condition, and dying two hours after labour, found that it was the seat of a diffuse adenomyoma, and that the stroma of the latter had been converted into typical decidua; this, Cullen says, "is a proof of the mucosal origin which would certainly tend to convince the most sceptical."

Cullen reports a case of his own in which there was an unruptured tubal pregnancy on the left side. There was a myoma in the fundus and an adenomyoma of the left uterine cornu. The stroma of the latter growth had in fact undergone decidual change, "although the adenomyoma was at least 9 cm. away from the tubal pregnancy" (Fig. 190).

Boxer records a case in which bilateral interstitial ectopic pregnancy was associated with cornual adenomyomata and draws attention to the connection between



FIG. 191.—Cystic adenomyoma lying in the left broad ligament. It displaced the tube and ovary upwards, and to the right side. (After Döderlein and Herzog, *Surgery, Gynecology, and Obstetrics*, Fig. 1, p. 18, January 1913.)

the "duct system of von Recklinghausen's tumours," and the lumen of the tube. He accepted Micholitsch's view as to the etiology of tubal gestation in these cases.

Theodore Döderlein and Max Herzog described "A new type of ectopic pregnancy. Pregnancy in an adenomyomatous uterus."¹

The patient was aged thirty-seven years. One year before observation she had undergone a complicated abortion without medical aid. Eight months later she was pregnant, and at the fourth month pain was felt in the lower abdomen. Three months later still, the patient was examined by a doctor for haemorrhage and a tumour was discovered. This tumour lay to the left of the uterus, and pushed that

¹ *Surgery, Gynaecology, and Obstetrics*, No. 16, p. 14, 1913.

organ upwards and to the right (see Fig. 191). The tumour felt harder than a gestation-sac. The cervical canal was patulous. At the operation the uterus was found to be enlarged and pushed over to the right by a tumour within the left broad ligament. The growth arose below the level of the tube. Both tubes were intact and opened into the uterus. The growth in the broad ligament communicated with the uterus by a channel which admitted the tips of two fingers. On slitting the canal open a large cavity was found inside the tumour, and within it was a



FIG. 192.—Same specimen as shown in Fig. 191. The cystic adenomyoma is seen to communicate with the uterine cavity. It contained placental tissue. (After Döderlein and Herzog, Fig. 2, p. 18, *l.s.c.*)

placenta in a good state of preservation (see Fig. 192). A fairly typical, though quite irregular, decidua was found. There was histological proof that the growth was an adenomyoma, the gland-tissue of which communicated with the uterine mucosa. The authors repeat the oft-made statement that adenomyomata beneath the tubal angle cannot be Wolffian. Their explanation of events was that the ovum had created a cavity for itself; the embryo had died and was expelled in fragments. In removal of the fragments and subsequent manipulations the mucosa of the connecting canal and of the cervix had been more or less destroyed and the opening made larger.

Zacharias showed a case of an adenomyoma the size of a hen's egg, which he tried to enucleate during early gestation. The patient was aged twenty-two years,

married three years. In 1909 a child was born, and two months later conception occurred again. There was great pain. In the attempt to enucleate the tumour it was found to be fused with the decidua, and the ovum had prolapsed into the bed of the tumour and was removed with it. There was no capsule. The growth contained a cyst the size of a walnut, which did *not* communicate with the uterine cavity.

Amos described a case of decidual formation in an adenomyoma, and also in a tumour of the abdominal wall. The uterus was removed on account of a myoma. Supravaginal amputation was performed during the fifth month of pregnancy. The uterine wall was diffusely thickened and lumpy. There was a large adeno-

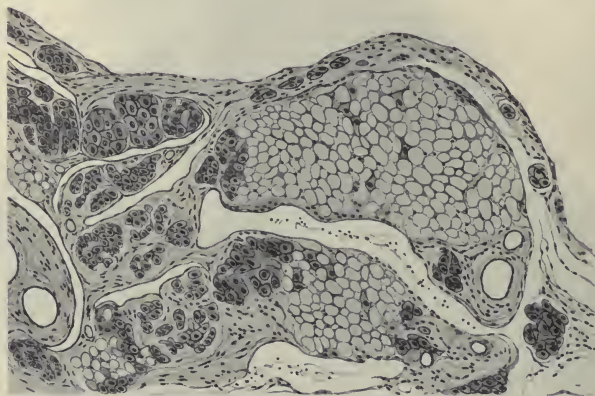


FIG. 193.—Showing decidual cells in omentum in a case of tubal pregnancy.
(After M. Penkert, *Zeitschr. f. Geb. u. Gyn.* Bd. liv. Fig. 1, p. 84.)

myoma and many round myomata present. The stroma of the adenomyoma showed decidual change. The patient had noticed a small warty growth on the anterior abdominal wall for some time. This had not increased in size until pregnancy intervened, when it got larger. It was a connective-tissue tumour, and its stroma had undergone decidual transformation.

R. Meyer collected three cases of 'adenomyometritis' during gestation. In each case the uterus was three months gravid. In the first specimen the mucosa of the cavum uteri penetrated the muscle over the whole circumference of the tumour. The glands were single, and not branched; they had the usual 'cytogenous' investment, but this showed *no* decidual reaction. In the second case the adenomatous growth lay deep in the muscle; there was a cytogenous stroma, but no decidual change had occurred in it. In the third case the mucosa was normal. The growth arose from the *peritoneum* covering the uterus. This

for the space of 1 cm. was puckered, and microscopically the serosa could be seen running into the muscle for the space of 2 cm. The stroma was *decidual* in parts. There were papillae in the cysts large enough to be seen macroscopically. Some of these papillae reached to and projected on the serous surface. Here was a case of a serosal growth showing decidual reaction.

Alfieri lately described the serosal changes which occurred during pregnancy. He says that during gestation the peritoneum possesses a high cubical or cylindrical epithelium. This is often not the case, the peritoneum usually remaining unaltered.

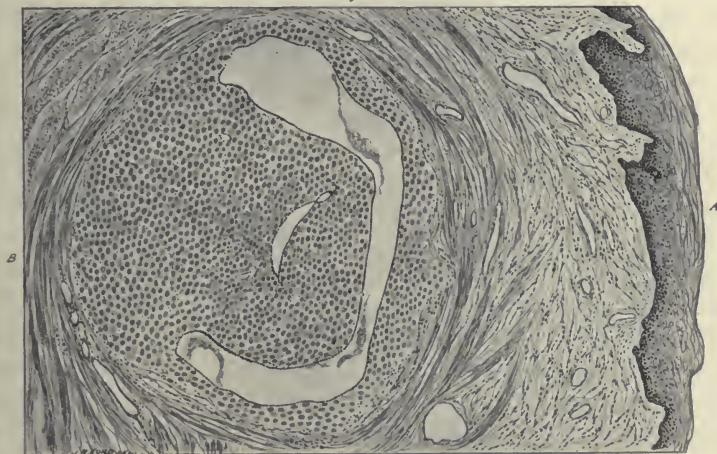


FIG. 194.—Adenomyoma of the recto-genital space adherent to the pregnant uterus. Section showing the structure of a portion of the 'growth' which was removed from the posterior vaginal fornix. (Re-produced from *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, July 1914, p. 390. W. S. A. Griffith.)

A = vaginal wall. *B* = cytotogenous tissue which has undergone decidual change. This surrounds and distorts a cystic space which is lined by flattened epithelial cells and is obviously a dilated gland-tubule.

Under adhesions, however, this metaplasia frequently occurs. It also occurs in the newly-born and in the foetus. It is also known to happen in the non-gravid uterus.

In tubal pregnancy decidual change has been found in the ligamentum latum.

Hirschberg described decidual change on the vermiform appendix during pregnancy. I have myself seen the same change occurring as round maculae of reddish-pink colour on both ovaries and on the peritoneum at the seventh month of gestation in a case which was operated upon for myoma complicating pregnancy. Penkert has shown decidual change in the omentum in a case of ectopic pregnancy (see Fig. 193).

W. S. A. Griffith showed microscopic sections of portions of tissue removed

from an adenomyoma of the recto-vaginal septum, in a woman who was near full term. The cytogenous stroma was seen to have undergone decidual metaplasia (see Figs. 194 and 195). Griffith regarded the epithelium as Müllerian in origin. This conclusion gave rise to considerable debate.¹

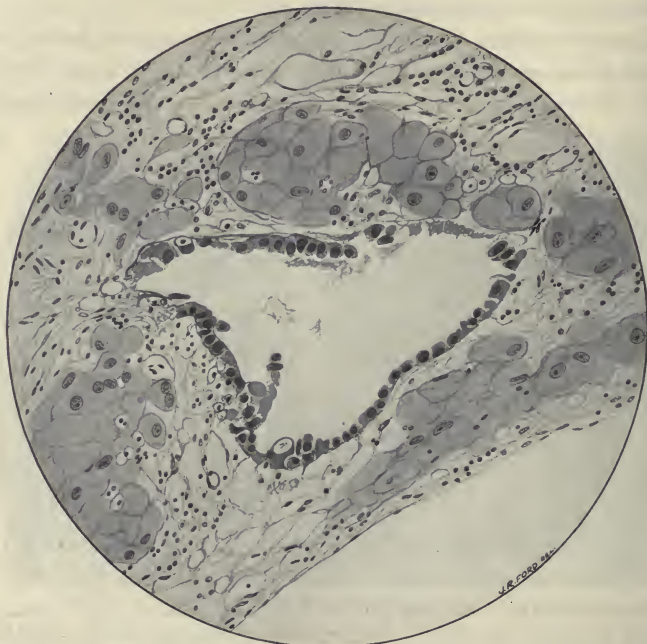


FIG. 195.—Adenomyoma of recto-genital space adherent to the cervix of a pregnant uterus, showing that the cytogenous tissue has undergone decidual change. The decidual cells under high magnification are seen arranged around a gland-tubule, the epithelium of which has not suffered so much from pressure as has the tubule shown in the preceding figure. (After W. S. A. Griffith, *l.s.c.*)

ADENOMYOMATA AND MALIGNANCY

When in 1903 Robert Meyer wrote on “Adenomatous Growths of Mucosal Origin in the Uterus and Tubes,” he was at great pains to show that what he subsequently called epithelial heterotopy, although infiltrating in its character, was not malignant. The infiltrating tendency of the mucosa was allowed free play owing to a want of true submucosa, but the invading processes were in no sense malignant. How frequent primary carcinoma of the Fallopian tubes would be, if

¹ See *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, July 1914.

this heterotopy was malignant or ultimately became so ! Meyer had seen follicular salpingitis in adeno-carcinoma and in sarcoma of the tube, but, he asks, what right have we to say that the one condition is the result of the other ?

Cullen (p. 188) mentions some cases in which adenomyomata had been excised from the uterus, and the after-results " graphically illustrated the benign character of adenomyomata of the uterus."

Sitzenfrey, speaking of adenomyoma of the recto-vaginal septum, says: " We have had half a dozen cases where the fusion between the uterus and rectum could be separated more or less easily by blunt or sharp dissection. Although infiltrated bowel was left behind at the operations, and although the histological examinations proved the presence of adenomyoma in the bowel-wall, there was not a single recurrence even after ten years."

Füth's case previously mentioned and that of von Franqué reported by Kleinhans (Case II.), and also that of Moraller, showed the same benign character. The patients recovered from operation with a lump in the anterior wall of the rectum which subsequently disappeared.

Rump's case of recto-uterine growth was well four years after operation, and that of Glöckner two years later. In one of Meyer's cases nearly the whole of the vagina was excised ; the vaginal wall was riddled with gland-tubules. The upper part could not be removed, because it was so densely adherent to the rectum ; nevertheless, " cure occurred contrary to expectation." The cases of adenomyoma of the recto-genital space have, more than any other class, clearly demonstrated both the infiltrative propensity and the non-malignant character of these growths.

My own view is that adenomyomata *may* become malignant, but that they do so very rarely. The reasons for coming to this conclusion are based :

1. Mainly upon the investigation of a semi-solid semi-cystic growth in the recto-vaginal septum which was situated at a distance from the uterus and did not implicate the rectal mucous membrane and in which the vaginal mucous membrane was also intact. This tumour had the structure of an adeno-carcinoma.

2. The causal relationship of chronic salpingitis with so-called *adenomyoma tubae* on the one hand, and with *papilloma* and *adeno-carcinoma tubae* on the other (see Fig. 383, p. 750), naturally leads one to the conclusion that a neoplastic process set up by chronic inflammation of a mucous membrane may result in malignancy.

3. That an adenomyomatous change may form a benign intermediate stage in the transition from an inflammatory to a malignant process is made probable by the occurrence of tubules lined by a single layer of cubical epithelium lying in the midst of cancerous areas in cases of *adeno-carcinoma tubae*.

Sitzenfrey records a case of multiple squamous carcinomatous nodules arising from the corporeal endometrium in a case of *adenomyometritis* (adenomyoma).

Rolly of Heidelberg described a case of adenomyoma uteri with carcinomatous change, and the formation of metastases. The specimen consisted of a uterus



FIG. 196.—Adenomyoma of the recto-vaginal septum, showing microscopically what was considered to be carcinomatous change. (See also Fig. 183. After Max Schwab, *Beiträge zur Geb. u. Gyn.* vol. xii, Fig. 2, p. 107, 1908.)

showing an intramural calcareous myoma, left-sided cystic adenomyoma, right-sided adenomyoma. The last showed carcinomatous change. There were metastases in the bones, pleura, lymphatic glands, and liver.

The carcinoma was of the "large" alveolar type, but there were no mitotic figures in the nuclei of the cells. "Instead of cylindrical cells there were large polyhedral and round cells with oval irregular nuclei."

Babescu published a case in 1882 in which there was a subserous fundal myoma the size of a man's fist. Absolutely in the middle of this growth lay a soft cylindrical-celled carcinoma quite independent of the mucosa. There was a "fresh" metastasis in the liver and miliary cancerous nodules on the pleura.

Von Recklinghausen published three malignant cases in his monograph in 1896.

The first case was that of Hermann Freund. The patient was a sterile woman forty-four years of age. The periods were profuse and painful. For four years the loss had been so severe as to cause very extreme anaemia. The uterus was about the size of a child's head; was firmly adherent to the bladder, caecum, ileum, and vermiform appendix. Freeing of the uterus was very difficult, and a cystic ovary and tube also gave great trouble. In spite of a normal temperature for six days, the patient died exhausted seventeen days after operation.

The specimen is described as "adenomyoma and cystadenoma (with epithelioid tubercle), diffusely distributed throughout the whole corpus uteri, but most extensive on

the dorsum and fundus." "Infiltrating *myoplastic* cylindrical-celled cancer in the central layers of the right wall of the body." There was a simple myoma also seen, and also hypertrophy of the tubes.

Case 2.—The patient was aged fifty-five years, sterile. There was a haemorrhagic, offensive discharge. The uterine tumour was the size of a man's fist. Curettings were diagnosed as carcinoma. Abdominal hysterectomy was performed. There was no sign of recurrence fifteen months after operation. Von Recklinghausen described the case as an "infiltrating *myoplastic* cylindrical carcinoma of the central layers of the corporeal walls; epithelioid tubercle; general hypertrophy of the uterus "without a myoma."

Case 3.—The patient was sixty-two years of age. The uterus was nearly round in shape, its body was the size of a man's fist. There was a cystadenoma of one of the ovaries. Eugene Bockel removed the tumour by supravaginal amputation.

The specimen is described as "an infiltrating mucosal cylindrical-celled cancer of the central layers of the uterine wall, with a subserous myoma undergoing myxomatous and cystic degeneration." There are no illustrations either of the macro- or microscopic preparations appertaining to these three cases.

Von Recklinghausen thought the "rare" mucosal growths were more prone to cancerous change than his organoid tumours.

Schütze, writing in 1907, said that adenomyomata were morphologically benign growths of the endometrium, but that they laid the foundation for adenocarcinoma.

Max Schwab recorded a case of "multiple adenomyomata of the uterus undergoing carcinomatous degeneration." The patient, a II-para, was thirty-seven years of age. The uterus was adherent to the rectum by thin adhesions which, when separated, showed normal adnexa. In Douglas's pouch was a curious tumour shaped like a hen's egg and lying obliquely. It was thought at first to be an old haematocoele, and it was doubtful whether it was covered by peritoneum or not. The tumour was so adherent to the rectum and to the vagina that it could not be separated. The mass was then tapped for pus without result. Then a strong *capsule* was incised, and soft medullary tissue "sprang out." It resembled a myoma with central softening. The central part was easily removed and the thick capsule left behind. Subsequently, four tiny nodules were enucleated from the fundal part of the body of the uterus (see Fig. 183, p. 359). One was an encapsuled myoma, the other three were not encapsuled, and proved to be the same in character as the recto-cervical growth. Figure 196 shows the curious structure of these nodules. The radial arrangement of the "carcinomatous" portion is the chief feature. The sections were submitted to Robert Meyer, who seems to have cautiously withheld his opinion as to malignancy, but asked Max Schwab to publish the case.

Schwab could only find four other examples of "malignant adenomyomata," in which the growth was covered by healthy uterine mucosa. There were those of

Babes (a questionable example), Rolly's case, and the two cases of Dillman. Rolly and Dillman regarded their specimens as Wolffian. Schwab favoured the view that in his case the growths were mucosal (Müllerian).

Schwab's case, from the description, seems to differ from those already recorded in the section dealing with the recto-genital space; in none of the former examples was there a "capsule" with a soft growth inside.

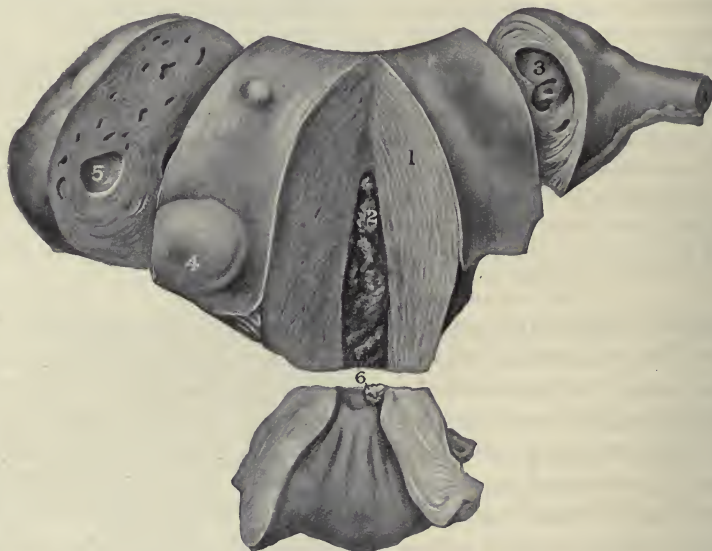


FIG. 197.—Cornual cystic adenomyoma associated with adenocarcinoma of the body of the uterus.
(After Grünbaum, *Archiv f. Gynäk.* lxxxvi. H. 2, S. 400.)

1 = anterior uterine wall. 2 = adeno-carcinoma. 3 = adenomyoma at the tubal angle. 4 = subserous cystic adenomyoma. 5 = cystic adenomyoma. 6 = boundary of adeno-carcinoma at cervical level.

Heinrich Dillman, a pupil of von Hausemann's, published two important cases of malignant adenomyomata of the uterus¹ under a notice "Nachdruck verboten!"

In spite of the prohibition it may be admissible to mention that Case I. is described as "myoma adenomatosum malignum cum metastasibus hepatis, glandularum lymphaticarum, carcinomatosis peritonei, peritonitis ichorosa et purulenta."

Case II. was an "Adenomyoma cysticum malignum uteri cum metastasibus pulmonis dextri, hepatis, intestini, peritonei, peritonitis fibrino-purulenta."

Dillman did not accept von Recklinghausen's views on morphology, but thought

¹ *Zeitschr. für Krebsforschung*, 1904, 2. 333.

the above cases were Wolffian on topographical grounds. The growths were dorsal and subserous.

R. Meyer, who has repeatedly expressed his disbelief in the malignant possibilities of adenomyomata, states in regard to the above two specimens: "The remarkable feature in these cases is the malignant degeneration."¹

Cullen (p. 194), 1908, mentions six cases of epithelioma of the cervix in associa-

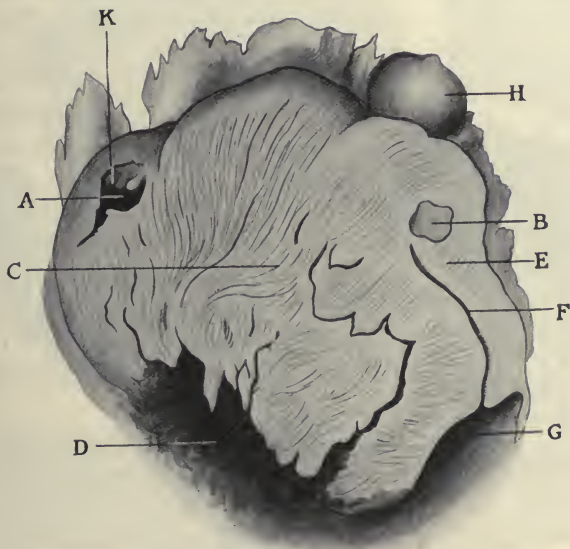


FIG. 198.—Right half of N. S. Iwanoff's uterine tumour.
(From *Monatsschr. für Geb. und Gyn.* Bd. vii. Fig. 1, Taf. iv., 1898.)

A=glandular space and cyst in same. B=myoma of anterior wall of uterus. c=uterine growth. d=carcinomatous part of c. e=uterus. f=cavum uteri. g=vagina. H=ovary.

tion with diffuse adenomyoma of the body of the uterus. Also two cases of diffuse adenomyoma in conjunction with adeno-carcinoma of the body. "In both of these the uterine mucosa had been destroyed, and the carcinomatous growth so overshadowed the picture that the origin of the glands in the myomatous growth was naturally totally obscured."

Grünbaum also described a uterus which showed combined cancer of the body and cornual adenomyomata (see Fig. 197). In this case the patient was sterile. There was a symptomless extensive carcinoma of the body of the uterus, and two cornual adenomyomata were present. The symptoms were referable to the bladder

¹ *Ergebnisse der allgem. Pathologie*, 9 (1903), 2 Abteil. S. 621.

only. A tubo-ovarian abscess lay in the pouch of Douglas. The carcinoma extended to the cervix, which was therefore removed after a supravaginal amputation of the uterus had been performed.

Cancer of the uterus is said to be less frequently associated with adenomyoma than with myoma (Meyer).

I have only been able to find two cases of *sarcoma* associated with adenomyoma, viz. those of Iwanoff and Bauereisen. Grünbaum mentions a third, that described by Kaufmann in his *Lehrbuch der path. Anatomie*. This book I have been unable to obtain. Iwanoff's case (see Figs. 198, 199, and 200) was that of a woman aged thirty-eight years. The uterus was enlarged and retroflexed. There was a cauliflower growth in the posterior fornix. This was removed in May 1891, and again in 1892. Several months later the vagina was filled with new growth, and this was again cleared out, and all went well for two years. In 1897 the vaginal tumour was insignificant in size, but

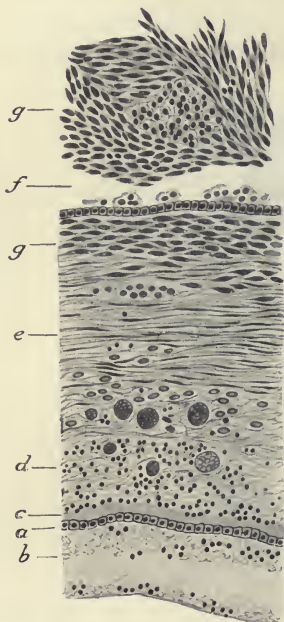


FIG. 199.—Microscopic characters of N. S. Iwanoff's uterine tumour (*l.s.c.*).

a = cubical epithelium of cyst-wall. *b* = inner lining of fibrin and leucocytes. *c* = membrana propria. *d* = connective tissue infiltrated with leucocytes. *e* = smooth muscle. *f* = glandular hollow space. *g* = sarcoma.

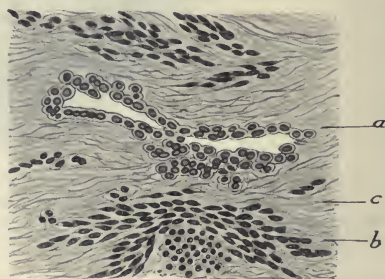


FIG. 200.—(Iwanoff, *l.s.c.*)

a = gland. *b* = sarcoma. *c* = connective tissue.

now the pelvis was filled by a growth. There was difficulty with micturition and defaecation, and severe pain. The patient died. The growth in the vagina was an adenocarcinoma.

In the posterior wall of the uterus was a *sarcoma*. The lower part of this growth, which ran to the vaginal vault, contained gland-spaces, lined by epithelial cells which also ran in the intercellular substance singly or in groups. Such an arrangement bespoke an *adeno-carcinoma*. At the upper fundal part of the sarcomatous

growth was a cyst and typical gland-tissue, so that the component parts were fibrous tissue, smooth muscle, gland-tissue, cysts with cylindrical or cubical epithelium, and



FIG. 201.—Bauereisen's adenomyoma uteri sarcomatosum; specimen seen from the front.
(After Bauereisen, *Beiträge zur Geb. u. Gyn.* vol. ix., 1905.)

finally sarcomatous tissue. Therefore the author designated the case as "*Adenofibromyoma cysticum sarcomatodes carcinomatosum.*"

Bauereisen described a case of adenomyoma uteri sarcomatosum. The patient was a spinster aged forty-six years. Family history tuberculous.

Examination.—A slender, ill-nourished woman. Posterior vaginal vault filled as if by a haematocele. To the left of uterus a tense, elastic, partly solid tumour. Diagnosis, inflamed adnexal tumour.

A papilliferous growth proceeded from the fundus and formed the summit of the mass

felt *per vaginam*. A blood-cyst ruptured during removal, the source of which was the fundal tumour. On the adnexa were papilliferous masses secondary to the large fundal growth. The latter measured $4 \times 5 \times 7$ cm. (see Fig. 201). Its surface was nodular and presented grape-like masses resembling the "berries" of a vesicular mole or those of a cervical sarcoma. It looked as if a papilliferous growth from the interior of the uterus had eroded through the wall. On opening the uterus a well-encapsulated myoma was found in the fundal wall. The papilliferous tumour overlay the capsule of the myoma, but had no relation to the encapsulated part of the latter. The myoma had a streaked appearance and presented cystic spaces. In the cavity of the uterus was a polypus, and other myomata were seen in the lower part of the corpus uteri. Microscopically, the muscular capsule of the myoma was seen to fuse with the richly cellular elements of the papilliferous cystic growth. The rod-shaped nuclei of the muscle-cells lost themselves in the large irregular-shaped nuclei of the tumour-cells.

The fundal myoma differed from the lower ones in being highly cellular, and in having a very irregular structure. It had a very similar structure to the papilliferous haemorrhagic growth. In fact, Bauereisen thought it was sarcomatous, but not to the same extent as the latter.

In the papillary cystic tumour were strands of cells in a myxomatous vascular matrix. The cells had nuclei of various shapes which stained deeply.

The illustration of the microscopic section is unsatisfactory, and the author says nothing about the arrangement of nuclear figures. In the proximal part of the papillary growth were glands showing a scattered arrangement, surrounded by a cytogenous mantle which Bauereisen regarded as favouring a uterine origin, "but whether from Müller's duct or from the normal mucosa was a theoretical question to which only a speculative answer could be given."

ADENOMYOMA AND TUBERCLE

In investigations on the Fallopian tubes in cases of salpingitis isthmica nodosa, tuberculous lesions have been so frequently found that many authors have come to regard tubercle as an etiological factor of adenomyoma. Meyer showed that tuberculous inflammation had no specific faculty producing the epithelial heterotopy, but that the latter was to be found in all inflammatory lesions, however produced.

In one of my cases—that of an adenomyoma of the posterior uterine wall—there was bilateral tuberculous salpingitis, but there was no invasion of the uterine growth by tubercle bacilli. Grünbaum writing in 1908 states that "tuberculous degeneration of adenomyomata" has been recorded in five instances—by von Recklinghausen, Lichtenstein, Hölsi, Archambault, and Pearce (Pozzi). Landau's Case XIII. is also mentioned by Grünbaum. It was that of a woman aged forty-five years. A myoma was supposed to have existed for five years. The tumour was adherent to the bladder and caused pain. It proved to be a diffuse adenomyoma riddled with caseating

tubercles. The caseation was principally found in the adenomatous portions. Tubercle bacilli were demonstrated. This author regarded the growth as a *locus minoris resistentiae*. The patient had old lung-trouble which had secondarily infected the uterine growth.

In Pozzi's case, published by Archambault and Pearce in *Revue de gynécologie*, 1902, the patient was a virgin aged twenty years. The uterus was infantile and retroverted. There was slight adnexal inflammation. The patient suffered from pulmonary tuberculosis.

The diagnosis of fibromyoma or tuberculous salpingitis was made. At the operation many adhesions were found. The uterus was irregular, and was removed by supravaginal amputation. In the posterior wall was a rounded mass reaching down to the cervix. It had the typical structure of a myoma. Bacteriological examination for the gonococcus and for the tubercle bacillus was negative. Histologically there was extensive tuberculous infiltration in the uterine growth and on the peritoneum, also in the right Fallopian tube. The uterine tumour was an adenomyoma. It was a case of "implantation" of tubercle from the lungs.

Von Recklinghausen's cases have already been recorded (see p. 370).

In Lichtenstein's case the muscle-wall of the uterine horn contained numerous tuberculous foci. The tubercle was not regarded as the primary lesion. Its source was unknown.

In my Case II.¹ there was tubercle of both Fallopian tubes running down to the cornu uteri, but no tubercle was seen in any of the sections of the growth in the posterior wall of the uterus. One sister had died of consumption at the age of forty-five years. The patient complained of an offensive discharge which she stated was passed *per vaginam* and *per rectum*.

On examination the abdomen was distended, and the whole of the large bowel was filled by faecal masses. There was a hard fixed mass rising out of the pelvis to within a finger-breadth of the umbilicus. The mass extended out into the left broad ligament where it was fixed. *Per rectum*, a fish-bone 1½ inches long was found sticking into the mucous membrane, but no sinus was discovered anywhere. At the operation, the omentum was adherent to the pelvic viscera. The sigmoid flexure ran over the top of a cystic mass lying in the left pelvis, and over the fundus of the uterus; it then entered the true pelvis on the right side. This part of the bowel, which was enormously thickened, was separated from the pelvic structures with difficulty. The left-sided cyst was a large abscess which burst during dissection; it was densely adherent to the rectum low down. The uterus had to be bisected in order to effect an entrance into the deeper parts of the pelvis. Finally the uterus and abscess-sac were removed *en masse*.

¹ *Trans. Obstet. Soc. Lond.*, 1906.

The uterus is shown in Fig. 202. The growth will be seen to occupy the outer two thirds of the posterior wall and fundus. One angle of the tumour mass lies near the internal os, otherwise the growth is peripheral in the bulk of its extent. There are one or two naked-eye cysts at the fundal extremity. The microscopic features are seen in Fig. 203. The uterine mucosa is not thickened. Both Fallopian tubes were the seat of a chronic tuberculous process. That on the left had formed a large tubo-ovarian abscess. Seven inches of rectum were removed. The walls of the bowel were $\frac{5}{8}$ inch in thickness and of stony hardness. This proved to be free from growth.

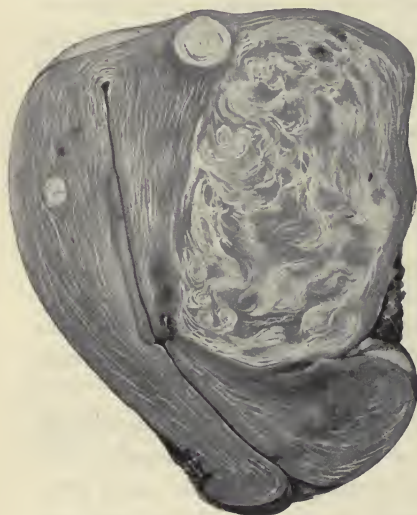


FIG. 202.—My own case of adenomyoma of the posterior wall of the uterus associated with double tuberculous salpingitis.



FIG. 203.—Microscopic character of growth shown in Fig. 202. The mucosa of the cavum uteri has deeply invaded the muscularis. No tubercle was found in the growth, but both tubes were tuberculous.

A microscopic section of the mucous membrane shows the endometrium dipping down here and there into the muscularis. This invasion is enough to justify the view being taken that the growth is of mucosal origin, although the naked-eye drawing would not convey this impression except at the lower angle which approximates to the internal os.

DIAGNOSIS, PROGNOSIS, AND TREATMENT

I. Uterus.—In von Recklinghausen's monograph *Die Adenomyome und Cystadenome*, 1896, W. A. Freund appended a clinical note "On the Voluminous Adenomyomata of the Uterus," in which he stated that these growths presented a definite clinical picture by which they could be diagnosed. There was a history of debilitated childhood. Menstruation appeared late, puberty was postponed.

The periods were profuse and painful. Irregular haemorrhage was common, there was pelvic peritonitis and marked anaemia. Bodily functions were impaired, and the growth led eventually to complete incapacity for work. Objectively there were signs of general hypoplasia and infantilism. The tumour had its situation in the dorsal wall of the uterus. Pelvic peritonitis and fixation of the pelvic organs was a feature. The site of election was the cornu uteri, whence the growth spread downwards towards the cervix.

Cullen (*l.s.c.*) says: "Diffuse adenomyoma of the uterus has, thanks to the work of von Recklinghausen, become a definite pathological entity, but heretofore it has not impressed surgeons as having a very definite and peculiar train of symptoms. In the early years of our investigations we also failed to detect it clinically; but in the early and fairly advanced stages of the process, so definite are the symptoms that the hospital assistant now frequently comes and says that a given case has all the signs of an adenomyoma, and that he feels sure that this is the cause of the bleeding. We accordingly see that this disease has very characteristic symptoms and must be given its proper place in our list of uterine diseases which may be clinically recognized." Cullen gives a long list of morbid conditions which cause uterine haemorrhage and more or less pain, and which have to be differentiated from adenomyoma.

In spite of the foregoing opinions there is no doubt that in many, if not in most, cases, the diagnosis of adenomyoma is made *only at the operation or subsequently by the microscope*. We are therefore obliged to accept the view that an opinion expressed before operation only amounts to a probability.

Freund's 'clinical picture' was soon contested. Pick expressed his doubt as to the possibility of an exact diagnosis. L. Landau stated that as far as clinical symptoms went these growths could not be differentiated from myomata.

Funk, on the evidence afforded by two cases in which a correct diagnosis was made before operation, strongly supported Freund's views. The diagnosis was founded on the growth starting at the tubal angle and growing downwards; also on the semi-fixation of the uterus by adhesions. Von Rosthorn published two cases of adenomyoma, which agreed clinically with Freund's data. The diagnosis, however, was not correctly made in either of these cases, and von Rosthorn stated that there were many adenomyomata which presented no characteristic 'clinical picture.' Freund's diagnostic points were not substantiated by Polano's investigation into the symptomatology of 100 cases collected from the journals. Signs of infantilism are rarely met with in comparison with the number of the cases. J. G. V. Meyer stated that clinical distinction on the basis indicated by Freund

was impossible in the majority of cases. All the features he gave may fail for adenomyoma and be present for myoma.

Jaschke reported a case at the Vienna Obstetrical Society in 1909 in which there was no weakness, no infantilism, no peritonitis, no dysuria, no local pain, and no sterility; in fact the patient had had ten children and four abortions.

Grünbaum¹ investigated twenty cases in Landau's clinic from their clinical aspect. Comparing Grünbaum's conclusions with those of Polano and others, we find that as regards:

1. *Age*.—The age in Landau's 20 cases (Grünbaum) varied between 32 and 51 years (average 41 years).

In Polano's series of 66 operation-cases, 55 patients varied in age between 30 and 50 years. Nine were under 30 years of age. Two were over 50 years. Forty-five per cent of the cases were in the fifth decade. Bearing on the age question, I find in the literature that Fritz Volk recorded a case of adenomyoma in a virgin aged 25 years;² and Treub³ performed vaginal hysterectomy for adenomyoma uteri on two patients aged 69 and 85 years respectively.

2. *Sterility*.—Grünbaum found that the influence of adenomyoma was not great. Nevertheless in 17 of the cases 10 were sterile and 6 parous women had borne 10 children.

Polano and Kudoh, writing on this question three years before (1905), found from 100 cases there were 68 married women of whom 53 per cent were fertile and 47 per cent sterile. This 47 per cent sterility in adenomyoma was contrasted with 20 to 25 per cent sterility in myomata.

The above estimation, Grünbaum says, should be modified. Rustein had shown that in 7 of Olshausen's cases 6 who were married were remarkably fertile: there were 18 full-term births and 12 abortions, an average of 5 pregnancies each. In Jaschke's case (*l.s.c.*) the patient had 10 children and 4 abortions.

3. *Menstruation*.—(a) *Onset*.—There is nothing particular to note about the time of onset. Polano found that in 23 cases it varied between 12 and 19 years. The onset at 13 years occurred in 30 per cent, and at 17 years in 21 per cent.

(b) *Course and Amount*.—In 16 of the Kudoh-Polano series menstruation was regular in 63 per cent, irregular in 37 per cent. It was excessive in 62 per cent of the cases, normal in amount in 18 per cent, and scanty in 18 per cent of cases.

Grünbaum found that the usual complaint was menorrhagia and metrorrhagia; irregular haemorrhage, uninfluenced by curettage and cauterization.

¹ Grünbaum, *Archiv f. Geb. u. Gynäk.* Bd. lxxxvi. H. 2, S. 387, 1908.

² *Gyn. Rundschau*, 1912, H. 9.

³ *Niedl. Gynäk. Ges.*, 1907.

4. *Pain*.—Nine patients in Landau's series of 20 cases complained of severe pelvic pain and sacralgia, especially so *during menstruation*. In 3 cases the pain was localized to the bladder; there was dysuria, and the pain in two instances led to retention of urine and the frequent resort to catheterization.

Retention of urine was the main symptom in J. B. Hellier's case (*Lancet*, 1913).

Polano says that the principal symptoms are *haemorrhage* and *pain*. Out of 100 cases 37 traced the onset to pain.

5. *Development*.—Grünbaum found that Freund's statement as to infantilism was wrong. Ten of the 20 cases in Landau's clinic were well developed, and in only one instance did menstruation appear late.

Polano found that in 58 per cent the patients were anaemic, in 41 per cent normal as regards blood-supply.

6. *Gross Anatomy*.—(a) *Uterus*.—Polano and Kudoh found that in 25 cases the uterus and tumour formed a mass the size of a child's head. In 47 cases the mass was smaller.

The whole uterus was involved in 65 per cent of the cases. In 34 per cent the involvement was only partial. The outer surface of the mass was *smooth* in 77 per cent, and irregular or lumpy in 23 per cent. The tumour was *hard* in 85 per cent and *soft* in 10 per cent of the cases.

As regards pathological peculiarities, 10 tumours in the above series were large and cystic, 1 calcareous, 4 associated with cancer, but sloughing or necrosis never occurred in an adenomyoma. Grünbaum found that of 20 cases of adenomyoma 4 were associated with multiple myomata. In one case there was both tubercle and carcinoma of the endometrium. This was also present in cases A and B of von Recklinghausen's series (pp. 370-371).

(b) *The Adnexa*.—In one half of Grünbaum's (Landau's) series there were inflammatory changes in the adnexa (adhesions and inflammatory tumour-formation) sometimes with extensive adhesions of the bowel and omentum. Polano and Kudoh found *adhesions* in 89.5 per cent of cases.

Adenomyoma is far more frequently found associated with pelvic peritonitis than is myoma. Grünbaum, however, stated that a large intraligamentary adenomyoma may be present without any adhesive peritonitis; he does not consider that the frequent association of inflammatory adnexal tumours and adenomyoma is of much diagnostic value, and in this I agree with him, for in two of my cases the adnexal disease overshadowed the comparatively small uterine condition altogether. The importance of adnexal diseases lies in the fact that it accounts for a good deal of

the pain complained of in adenomyoma cases, and also that it complicates the operative measures which have to be carried out.

Grünbaum's 20 cases provided examples of ovarian cysts, tubo-ovarian cysts, salpingitis, hydrosalpinx, ovarian abscess, and pyosalpinx.

Both Polano and Grünbaum state that ante-operative diagnosis is problematical only; adenomyoma is a *pathological* entity clearly enough, but *clinically* it is a vagrant devoid of definite pathognomonic symptoms. Grünbaum quotes Landau as saying, "How is a clinician to decide what can only be found out by the knife and anatomy?" Polano drew up a table of comparison between adenomyoma and myoma, and found the age-incidence the same for each. The ratio between spinsters and married women was the same. In adenomyoma there were 15 per cent spinsters to 84 per cent married; in myoma 20 per cent spinsters to 79 per cent married women.

As regards sterility there was a divergence—47 per cent for adenomyoma as compared with 20 to 25 per cent for myoma. The usual error in diagnosis will be to consider the growth a myoma, and another mistake will be to diagnose an adnexal tumour. Large growths will easily lead to confusion in diagnosis.

II. Recto-Genital Space.—With regard to the adherent 'tumours' in the recto-genital space, they have been mistaken for haematocele, for cellutic abscess, for cancer of the rectum, and for an adherent adnexal tumour in the pouch of Douglas. In no case that I have met with in the literature, nor in any of my own, was the rectal mucous membrane involved; in all it was freely movable over the induration in the muscular wall. In many, ulceration of the vaginal fornix had occurred, producing a red or brown vaginal discharge and a tendency to bleed on contact. When advanced the ulceration leaves tongues of vaginal mucous membrane hanging in fringes between deep sulci, giving a coarse, papilliferous appearance. Each furrow represents the track of a single file of gland-tubules. These ultimately open up on the surface of the vaginal wall and produce deep straight furrows (see Fig. 178, p. 353). In my case the process stopped just short of bursting through the squamous epithelium, in Griffith's case it had done so, and in Kleinhans's case it shows the process carried to extreme limits.

Before ulceration has occurred diagnosis may be made by incision and microscopy, and when papillae are present one or more may be cut off for pathological investigation.

General Prognosis.—Freund said that the prognosis is worse in adenomyomata than in myomata. There is no doubt that curetting and medical treatment make matters worse. Polano states that the prognosis is "specially serious."

Fritz Volk pointed out the danger of curetting. The danger in neglected cases proceeds from haemorrhage, which, as in one case recorded in this article, led to a fatal issue. As an adenomyoma is far better nourished than an encapsulated myoma, it is not liable to the same degenerative changes as in the latter. A sloughing or gangrenous adenomyoma is a thing unknown, but cystic formation occurs sometimes to an extreme degree, as in the cases of Knauer, Amos, Breus, and Bauereisen.

Opinions are divided as to whether adenomyoma predisposes to carcinoma. As stated on p. 369, I believe that malignancy may supervene in an adenomyomatous process. Like other uterine growths, myomata for example, adenomyoma has in many instances been found in association with cancer of the body or of the cervix.

The intimate relationship with pelvic peritonitis is of great importance from the point of view of prognosis. Therefore, if we summarize the outlook we must regard an 'adenomyoma' as a haemorrhagic and painful structure which is found in bad company, its associates being inflammatory adnexal tumours, pelvic peritonitis, parametritis, and infiltrations into the bowel, whilst it can claim caseating tubercle, carcinoma, and sarcoma as occasional concomitants.

Treatment.—Small non-encapsulated nodules at the cornua of the uterus have been excised with cessation of symptoms, but enucleation is quite impossible. The removal of a wedge-shaped portion of the uterine wall wide enough to be quite free of the indurated area should be carried out.

For the diffuse variety nothing but total hysterectomy should be performed—whether this is done *per vaginam* or after laparotomy will depend upon the presence or absence of complications, such as fixation of the uterus and adnexal tumours of inflammatory origin; owing to the frequency of the latter, abdominal panhysterectomy is the more advisable procedure.

For extensive 'growths' in the recto-genital space, it has been shown that total removal or excision of the invaded bowel is unnecessary. These growths do not cause uterine haemorrhage. The indication for operation appertains to the bowel; when the tumour is left, there is a danger of stenosis and chronic intestinal obstruction, as one of the cases I have recorded fully proved. Moreover, ulceration into the vagina is very liable to occur. Some check is therefore required by way of operation. When assured by microscopic proof that the case is one of innocent epithelial invasion and not carcinoma, the removal of the entire uterus together with as much of the growth as possible is the best procedure. There is no need to resect a portion of the rectum.

All forms of radio-therapy (radium, X-rays) for adenomyoma are generally disappointing. They may be expected to excite the inflammatory process which is the pathological basis of the disease; but it must be mentioned that in Griffith's case of adenomyoma of the recto-uterine and recto-vaginal septum the use of X-rays was thought to have caused a shrinkage in size of the mass.¹

¹ *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, Oct. 1914.

SARCOMA OF THE UTERUS¹

By R. W. JOHNSTONE, M.D.
(Edinburgh)

THE first case of sarcoma of the uterus definitely recorded as such and supported by microscopic examination appears to be that published by Lebert in 1845. To all intents, however, the history of our knowledge of the condition only dates back to 1860, when Mayer presented a case to the Obstetrical Society of Berlin, the histology of the tumour being described by Virchow. Five years later, in his *Krankhaften Geschwülste*, Virchow definitely established the condition as a pathological entity, and gave the first description of a sarcoma of the endometrium. In this paper he also indicated the transformation of the elements of a myoma into sarcomatous tissue. In the next decade several cases were recorded by various gynaecologists of repute, and since then some five hundred cases in all have found their way into the literature.

Previous to Virchow's paper several cases of 'recurrent fibroids' had been recorded, notably by Hutchinson, Callender, West, and Paget. The description of these cases suggests at least the strong probability of their having been sarcomata, or instances of sarcomatous change in fibroids.

Frequency.—Sarcoma is one of the rarest forms of malignant tumour of the uterus, but at the same time it is probably not so rare as the earlier literature would lead us to believe. In 2649 cases of uterine tumour Gurlt found only 2 sarcomata. Roger Williams found 8 in 4115. Krukenberg found the condition occurred in 0·076 per cent of the gynaecological cases in Berlin during a period of six years. Von Franqué on the other hand puts the absolute frequency at 0·47 per cent.

The relative frequency of cancer and sarcoma of the uterus Poschmann places

¹ Valuable bibliographies will be found in Piquand's paper in the *Revue de gyn. et de chir. abdom.* ix., 1905, and in Veit's *Handbuch der Gynäkologie*, vol. iii., 1908. Only references to the more recent or important works are given here.

at 37 to 1; Gessner at 38 to 1; Krukenberg at 47 to 1; and v. Franqué at 20 to 1, the last named regarding sarcoma as equal in frequency to carcinoma of the body of the uterus.

In regard to *site* it is interesting to note that, contrary to what prevails in connection with carcinoma, sarcoma of the uterus is much more common in the body than in the cervix of the uterus. Piquand reckoned that of 393 recorded cases, 325 were in the body and only 68 in the cervix. Other authors estimate the pre-dominance of corporeal sarcoma even higher, so that in general we may take the relative proportion as being at least 5 to 1.

Classification.—Accepting the wider definition of sarcoma as a malignant tumour of mesoblastic tissue origin, it is apparent that in the uterus such a tumour may arise in the connective tissue and even in the muscular tissue of the wall, in connection with the walls of the blood- and lymph-vessels, and in the embryonic connective tissue of the endometrial stroma. Any attempt at classification on these lines would be hopelessly complicated; and while a purely regional classification into tumours of the uterine body, cervix, and *portio vaginalis* has the merit of simplicity, probably the most correct and generally useful is that adopted by Virchow—into sarcoma of the uterine wall, and sarcoma of the mucous membrane.

It is, however, impossible to adhere to this classification beyond a certain point. For in the first place we have to include in the first category the large group—probably the largest—of cases in which the sarcoma develops in a pre-existent myoma. These cases are topographically sarcomata of the uterine wall, but not essentially so. Secondly it is advisable, in order to avoid confusion, to place in separate groups, irrespective of their site of origin, those tumours which consist of several kinds of tissues—the mixed forms of sarcoma, and those in which the tumour-cells appear to originate from the endothelium of the blood- or lymph-vessels—the endotheliomata. Whether or not the latter should be in a separate group is a moot point, but in the present fluid state of our knowledge regarding them, it makes for simplicity to keep them apart from the more familiar forms.

The following classification has therefore been adopted, not as being pathologically correct, but as a working arrangement for the clinician:

I. Sarcoma of the uterine wall.

(a) Arising as sarcoma *de novo*.

(1) Diffuse.

(2) Circumscribed.

(b) Arising in pre-existent myoma.

II. Sarcoma of the endometrium.

(a) Diffuse.

(b) Circumscribed—including the 'grape-like' sarcoma of the cervix.

III. Mixed and special forms of sarcoma.

IV. Endothelioma—including perithelioma.

I. SARCOMA OF THE UTERINE WALL

(a) **Arising as Sarcoma "de novo."**—(1) *Diffuse*.—This is the rarest form of all, and is disregarded by some authors. It causes a uniform enlargement of the uterus, which, from its softness and shape, closely resembles the pregnant uterus. The cavity is enlarged and the endometrium thickened. Microscopically the sarcomatous cells, either round or spindle-shaped, are found diffused throughout the entire thickness of the uterine wall, lying between what is left of the muscle-fibres. They are believed to originate from the intermuscular or perivascular connective tissue. Possibly some of the latter would now be found to be peritheliomata.

(2) *Circumscribed*.—Into this category come only sarcoma-nodules arising *de novo* in the uterine wall. It is highly probable that in many cases this form is confused with sarcoma arising in a myoma, which is much commoner. Certain it is that together these two forms account for the great majority of uterine sarcomata.

In the earlier stages the growth may be definitely circumscribed, although even then it is but rare to find it actually encapsulated. Microscopically it may, in the early stages, be indistinguishable from an ordinary myoma. Later it spreads and actively invades the uterine wall. At first interstitial in position, the sarcoma may grow outwards and become subperitoneal. Cases are on record where the growth broke through into the pouch of Douglas. Others grow inwards and become submucous, and these appear to be particularly liable to become polypoid. In this form they project into the cavity of the uterus and even through the cervix; and in one case recorded by Pick the condition resembled the 'grape-like' sarcoma of the cervix. Obviously in such cases it may be impossible to state with certainty whether the growth started in the uterine wall or in the endometrium.

It is probably such polypoid cases as these that come to be regarded as 'recurrent fibroids,' portion after portion of the growth becoming pedunculated and being cast off or removed by operation. An average example of what may happen is to be found in a case recorded by Holland¹ for Phillips. Three 'fibrous polypi' were within a few months either passed or removed by the practitioner without histological examination. On removal of the uterus in hospital it was

¹ *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, London, 1908-9, vol. ii. pt. ii.

found to contain a large sarcoma, originally circumscribed but rapidly becoming diffuse.

An even more interesting and strange case has been related to me by Sir Halliday Croom. In the early days of his service as gynaecologist to the Edinburgh Royal Infirmary, a patient returned to his wards six times in the course of little more than two years. On each occasion he removed by the *écraseur* huge masses of apparently

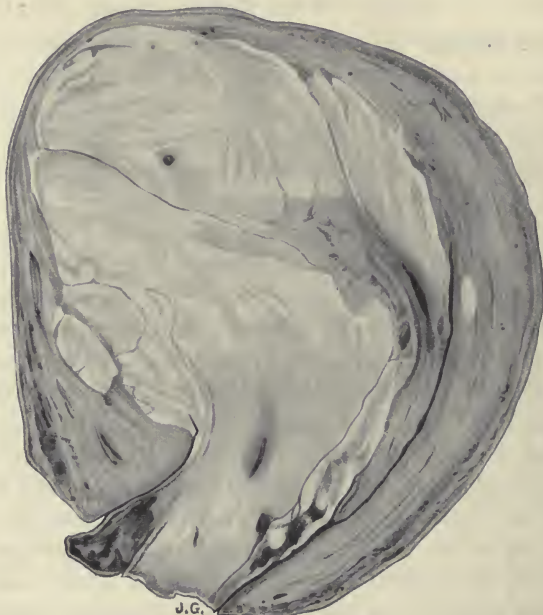


FIG. 204.—Circumscribed sarcoma of the wall of the uterus. (Barbour's case.)

The growth has erupted into the cavity of the uterus, and previous to hysterectomy, several large polypoid masses were removed *per vaginam*. The growth is also spreading towards the peritoneum at the upper part. The empty upper part of the uterine cavity may be seen to the right.

oedematous myoma as large as a foetal head. These were examined by the pathologist and pronounced myomatous. On the sixth occasion he performed pan-hysterectomy, and the uterus was then found to be sarcomatous.

On the other hand, not every 'recurrent fibroid' can be definitely stigmatized as sarcomatous. Of some it can only be said that they are actively growing myomata, although the strong probability is that they would ultimately, if not removed spontaneously or by operation, show definite signs of malignancy. In the case of others it may be impossible even by the microscope to distinguish with certainty between an

inflamed and necrotic fibroid and a sarcoma. A case in point is recorded by Lockyer,¹ in which a sarcomatous uterus was removed from a patient from whom Routh had some months previously removed what was believed on microscopic examination to be a sloughing fibroid polypus.² Lastly, there is little doubt that in some of these cases the real sarcomatous appearances may take years to declare themselves, owing to the cells retaining the capacity to advance to an adult stage of development, and therefore forming ordinary connective or myomatous tissue instead of the more vegetative round or spindle-shaped sarcoma cells. The practical 'moral' is that every fibroid polypus ought to be examined microscopically, particularly its base.

In a number of these polypoid cases inversion of the uterus has occurred, and considering the relative infrequency of sarcoma this appears to be a commoner accident than with submucous fibroids. A. R. Simpson has expressed the view that it is favoured by the softness and paresis of the uterine wall resulting from the malignant infiltration.

Strictly interstitial sarcomata never attain to any great size, but submucous and subserous tumours may do so. Perrin³ describes a specimen of Pollosson's as weighing 9 kilograms, while Piquand states that one of Terrillon's specimens weighed 20 kilograms or about 40 pounds. Their consistence is very variable; they may be quite soft in one part and hard in another. Never, however, are they as hard as a myoma.

On section sarcomata of the uterine wall have a homogeneous, cheesy, or brain-like appearance, yellowish-pink in colour. Very often they show areas of haemorrhage of a dark brownish-red colour, due to rupture of the thin unsupported embryonic capillaries. It is not uncommon, also, to find in them cystic spaces filled with straw-coloured or blood-stained fluid. Occasionally such spaces may be as large as an orange. Small cysts may be due merely to oedema; larger ones are the result of dilatation of lymphatics, or of necrosis of the sarcomatous tissue. Dilated blood-

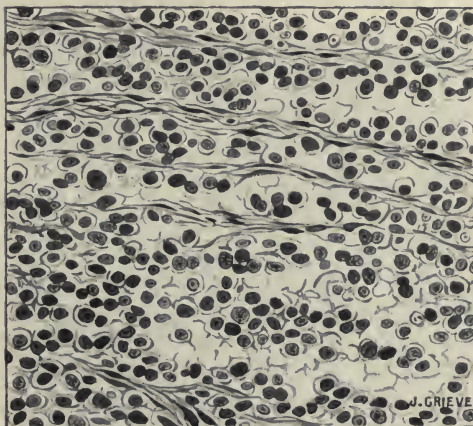


FIG. 205.—Round-celled sarcoma of the uterus.

¹ *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, London, 1907-8, p. 245.

² See also *Gynaecology for Students and Practitioners*, Eden and Lockyer, Figure 235, p. 505.

³ *Lyon Méd.*, 1910, vol. cxiv. p. 867.

vessels, forming large sinuses, are a feature of the so-called 'telangiectatic' specimens. Microscopically these tumours are found to be of the round or spindle-celled varieties, or more often of both mixed. Giant-cells may also be present in the mixed-celled forms. Blair Bell¹ believes that when multinucleated giant-cells (sarco blasts) are seen, the sections should be searched for the presence of striated muscle-cells, as some of the specimens turn out to be rhabdomyosarcoma, a form of mixed mesoblastic tumour.

(b) **Sarcoma arising in a pre-existent Myoma.**—Sarcoma arising in a myoma is usually found towards the centre of the tumour, and is generally rather abruptly differentiated from the surrounding myomatous tissue. Occasionally it is found towards the periphery of the tumour. In most cases there are other myomata

present, for they rarely occur singly, but the malignant change is usually confined to one. The sarcomatous area presents the usual homogeneous, cheesy, yellowish appearance, with frequent haemorrhagic areas and cystic spaces. When well marked the condition is readily recognized, but in the early stages it may escape detection by the naked eye. In the less common forms in which the sarcoma, instead of being somewhat circumscribed, occurs as a diffuse affection throughout the tumour, the nature of the condition may be masked by the

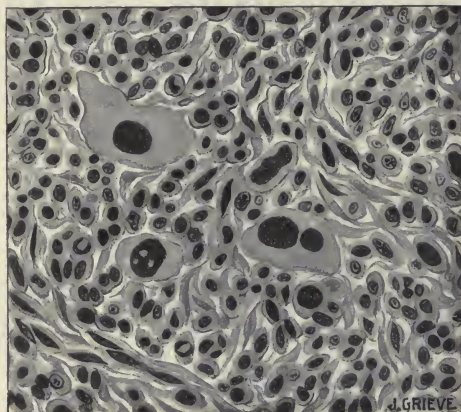


FIG. 206.—Mixed-celled sarcoma of uterus, showing round, spindle-shaped, and giant-cells.

persistence of wavy bundles of fibrous and muscular tissue. In advanced cases secondary sarcomatous nodules may develop in the muscular wall of the uterus outside the limits of the myoma.

The histogenesis of this form of sarcoma has given rise to considerable controversy. That sarcoma may develop from the connective tissue of the myoma is accepted by practically all. But there are still several pathologists who hesitate to accept the view that it may also arise from muscle-cells. The former mode of origin was first indicated by Virchow, whose description translated by Cullen² may well remain the last, as it was the first, word on the subject.

¹ *Journ. of Obstet. and Gyn. of Brit. Emp.*, 1914, vol. xxv, p. 1.

² Kelly and Cullen, *Myomata of the Uterus*, 1909.

"The degeneration, as I have traced it, is as follows. At certain points the intercellular substance commences to grow, and the cells increase through division. Thus more and more round cells are formed, at first small, later larger and larger and with bigger nuclei. Meanwhile the intercellular substance becomes less, and more rarefied, and, while the stroma increases, the muscle disappears entirely in many places. At other points it still persists and even increases. In this manner the trabecular character of the growth develops. The cells grow; many of them become angular and develop processes, and their nuclei reach the size of epithelial nuclei. They are, however, usually arranged in rows or groups. With this increase in the cellular elements the original stroma is in part or entirely replaced by the new growth. Such portions become soft, friable, and have a whitish or yellowish appearance. Comparatively large blood-vessels penetrate the softer portions and give rise to haemorrhagic infiltration. In this way a portion of the cyst-like spaces is produced."

The first observer to suggest definitely the muscular origin of the sarcoma cells was von Kahlden, who claimed to have observed the direct transition of myomatous cells into sarcomatous cells. Whitridge Williams,¹ in a paper published in 1894, exposes the somewhat unsatisfactory nature of von Kahlden's argument and dismisses his case as 'not proven.' He then describes a case in which he himself claims to demonstrate the transition. His claim is generally admitted, and his case may be taken as the first in which the process was observed. Since then his views have been confirmed and substantiated by many observers, including Pick, Morpurgo, Gessner, Veit, Gebhard, Aschoff, Ulesko-Stroganowa, R. Meyer,² and Weir³ amongst others. Meyer claims that the muscle-cell sarcoma is the commonest form of uterine sarcoma. Kelly and Cullen observed the apparent transition in 13 instances at least out of 17, the remainder being round- or mixed-celled sarcoma.

Most of these observers regard the transition from muscle-cells to sarcoma-cells as an instance of metaplasia from a muscle- to a connective-tissue type of cell. Meyer, on the other hand, regards the muscle-cell sarcoma rather as an instance of a destructively exuberant growth of immature muscle-cells, the degenerate forms of which are indistinguishable from degenerating connective-tissue sarcoma-cells.

Be that as it may, the apparent transition usually described consists in a gradual enlargement of the ordinary myomatous muscle-cell and of its nucleus, with a gradual increase in the nuclear chromatin, until the typical, large, spindle-shaped sarcoma-cell is reached. Such changes can only be observed at the periphery of the nodules, as towards the centre all trace of myomatous tissue is lost. Kelly and Cullen believe that in many instances hyaline degeneration is not only a precursor of sarcomatous change, but actually predisposes to it.

¹ *Amer. Journ. of Obstet.*, 1894, vol. xxix.

² Veit's *Handbuch der Gynäk.*

³ *Amer. Journ. of Obstet.*, 1901, vol. lxi.

It is probable that in some cases the sarcoma-cells arise from *both* the connective tissue and the myomatous tissue of the tumour at one and the same time. Such tumours, as well as those arising from the connective tissue only, may be either round- or spindle-celled, or more often mixed. The sarcoma of muscular origin is always purely spindle-celled (see Figures B, C, D, E, Plate XX. in Article on Myomata, Vol. II, p. 235).

In other words the cells of these sarcomata tend to conform to one of two types—the non-striped muscle-cell, or the connective-tissue cell.

“In the former or myoblast type,” says Leith,¹ “the cells are rather large, elongated

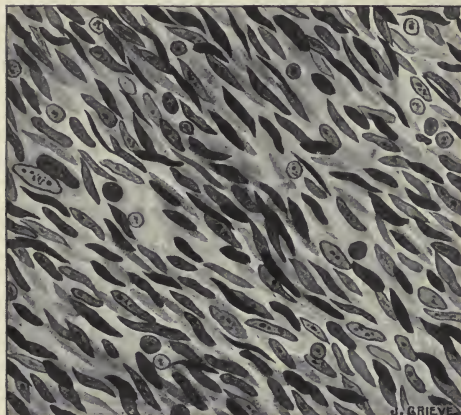


FIG. 207.—Muscle-celled sarcoma of uterus.

in shape, with large oval or elliptical nuclei and a good deal of protoplasm. By close superimposition they form bundles which interlace in every direction. There is little or no intercellular substance, and the blood-vessels are fairly numerous and capillary-like. The general appearance is strikingly like a young actively-growing part of a pure myoma, but the texture is opener in places, and the cells at times are large and may possess two nuclei. Multinucleated cells or cell masses occur occasionally, but mitotic figures are rare. There may be several such foci within a fibroid, whose structure otherwise is constituted by old well-formed fibro-muscular tissue, into

which the young growth seems to fade insensibly. In the other or fibroblast type, there is a greater irregularity in the size and shape of the cells. They are not superimposed upon one another, but are scattered, or at times clustered together, in a more or less plentiful granular or finely-fibrillated matrix. Cells with more than one nucleus are common, and multinucleated cells or giant-cell masses and mitotic figures are met with more frequently than in the myoblast type. The nuclei stain irregularly and often very deeply.

“Such as it is, then, the evidence points to the sarcomatous foci arising as recent growths within very much older tumours, as a result of an anaplasia, or reversion to embryonic type of certain cells of the fibroid—not any of the fully formed muscle or fibrous tissue cells, for that does not seem possible, but of young developing myoblasts or fibroblasts. Instead of proceeding to functionate as fully formed supporting tissue cells, after the fashion of ordinary young cells of this class, they revert to their earlier anatomical shapes,

¹ *Pathology of Tumours of the Corpus Uteri*, 1911.

and expend their energies in vegetative reproduction. Not only do the two histological types find an explanation on this hypothesis, but the aberrant instances which do not seem to belong to either type, may be referred to a still earlier mother cell, and be looked upon as the result of a reversion to the primitive undifferentiated cell from which the other two types spring."

In some cases, however, it is impossible to relegate a tumour to one or the other type. There are all gradations between the apparently benign but actively-growing myoma and the definitely sarcomatous growth, and what one observer would regard as benign another equally competent pathologist might be disposed to consider as malignant. There is, however, some prospect of our attaining greater definiteness in our knowledge through the researches of Mallory.¹ By a special method of staining absolutely fresh specimens fixed in Zenker's solution, this observer has been able to demonstrate the different features of the myoglia and the fibrogia fibrils. This enables the pathologist to trace the tumour-cell back with certainty to the myoblast or fibroblast type, and suggests fresh criteria by which to judge whether the myomatous cells are malignant or not. Raab² examined by this method several specimens which had been diagnosed as sarcoma by other observers using the older methods, and in three instances out of four he came to the conclusion that the diagnosis was not justified, and that the specimens were only actively growing but benign myomata.³

Frequency.—Making allowance for all errors it is generally believed and conceded that about 2 per cent of all myomata coming to operation show sarcomatous changes. Fehling and Hofmeier both give this figure, while Winter places it at 3·5, and Flatau and Basso,⁴ both arguing from a small series, give 4·8 and 5·7 respectively. Raab on the other hand places the frequency at only 0·3 per cent.

Nomenclature.—The dubiety as to the histogenesis of this form of sarcoma has involved the literature in a tangle of different terms, which in the space at our disposal it is impossible to discuss fully. Rightly or wrongly the term *Myosarcoma* has been adopted in most British and American writings as meaning sarcoma developing in a myoma. Strictly it connotes the myomatous origin of the sarcoma-cells to the exclusion of a connective-tissue origin, but, as Cullen points out, it has the merit that it indicates to the physician something of the clinical picture. At the same time the term ought to be restricted to cases in which the cells can be shown to have

¹ *Journ. of Med. Research*, 1904–5, vol. xiii.

² *Arch. f. Gyn.*, 1913, p. 389.

³ Some light might be thrown upon this whole question if records were published of the histological findings in secondary tumours, say in the lungs, in patients in whom the diagnosis of sarcoma arising in a myoma had been made. The correlation of such observations with the microscopic appearances of the primary tumour might afford some useful information.

⁴ *Monatsschr. f. Geb. u. Gyn.*, 1907, vol. xxv.

a myoblastic origin, while cases in which the fibrous stroma reverts, and forms an ordinary round-, or spindle-, or mixed-celled sarcoma, come under the heading of *Myoma sarcomatodes*.

Leiomyoma malignum is a term restricted to a very rare form of tumour consisting *purely* of young, actively-growing, unstriped muscle tissue of apparently benign nature. Its truly malignant nature is indicated by the appearance of very rapid mitotic division of the cells, by a tendency to invade contiguous tissues, and by the presence of metastatic deposits of pure leiomyoma in other parts of the body. Cases have been recorded by von Krische, Minkowski, v. Beesten, Schlagenhauer,¹ v. Hanseman, Ribbert, Mallory,² v. Franqué, and Charnet.³ Lockyer also refers to a case of Stanley Boyd's.⁴ Proust and Caraven⁵ describe a case of Geraudel's in which pure myomatous nodules were found in the liver, kidneys, stomach and intestines, peritoneum and ovaries, as well as in the uterus. The tumour-masses showed melanotic staining. The growth was best developed in the liver, but from its nature they believed the uterine growth to be the primary one.

II. SARCOMA OF THE ENDOMETRIUM

(a) **Diffuse.**—From what has been stated as to the tendency for interstitial sarcomata to invade the endometrium and even become polypoid, it will be understood that frequently it is difficult, or impossible, to distinguish in any given tumour whether it arose in the uterine wall or in the endometrium. In all probability, however, the endometrial origin of sarcomata is not very rare, although by no means so common as the mural. Most frequently the growth arises in the endometrium of the body of the uterus towards the fundus; and while it may spread so as to involve the whole of the mucous membrane of the body and cervix, it more commonly stops short at the region of the internal os, and does not affect the cervix. Very rarely, according to Piquand, is the diffuse form found confined to the cervix.

The uterus in these cases becomes uniformly enlarged and closely resembles a pregnant uterus. On section the endometrium is seen to be thickened, and occasionally the inner surface is shaggy, or may even be nodular and polypoid. The sarcomatous tissue is of the usual homogeneous cheesy appearance, yellowish-pink in colour, and often with areas of haemorrhage and necrosis in it. As a rule the line of separation between the mucosa and the muscular wall is clearly distinguishable, but in cases of very rapid growth the spread of the disease from the one layer to the

¹ *Arch. f. Gyn.*, 1911, vol. xev.

² *Lyon Méd.*, 1910, vol. cxv. p. 450.

³ *Journ. of Med. Research*, 1904-5, vol. xiii.

⁴ *Fibroids and Allied Tumours*. Macmillan & Co., 1917.

⁵ *Bull. et Mém. Soc. Anat.*, Paris, 1907, vol. lxxxiv. p. 305.

other may be visible to the unaided eye. Furthermore even in cases in which there is no obvious invasion, and the distinction between the muscle and the sarcoma appears clearly marked, the microscope may reveal a considerable infiltration of malignant cells into the muscle. Cases have been recorded in which the polypoid growths of the endometrium have so blocked the cervical canal that haematometra and pyometra followed.

In regard to the histology of this form of sarcoma different authors make very



FIG. 208.—Body of uterus with diffuse sarcoma of the endometrium.

a and *b* indicate the boundary between the muscular and mucous coats. Note the enormous thickening of the latter and the thinning in parts of the former. The cervix was also removed, and the patient was in good health two years after the operation. (Fordyce's case.)

varying claims. On the whole the round-celled form seems to predominate over the purely spindle-celled, but it is probable that if more sections of such tumours were examined it would be found that most of them are really mixed-celled—the round cell and the spindle-shaped cell being but representatives of different stages in the development of the typical connective-tissue cell. Some confusion also arises from the fact that spindle-cells on transverse section may be taken to be round cells. Blood-vessels are numerous, and largish blood-spaces not uncommon. The

sarcoma-cells have often a distinctly perivascular arrangement—a feature by no means peculiar to uterine sarcomata. The supporting fibrous stroma varies greatly in quantity, but is usually very scanty. The epithelial elements of the endometrium are usually destroyed, but cases have been reported in which remnants of glands were recognizable as such.

(b) **Circumscribed.**—Circumscribed sarcoma of the endometrium is more



FIG. 209.—Grape-like sarcoma of cervix (F. J. McCann's case).¹

The figure shows a recurrent growth removed from cicatrix in vagina after vaginal hysterectomy for smaller similar growth of cervix eleven months previously. X marks a cartilaginous area. The lower solid mass protruded through the vulva. The growth consisted of round- and spindle-celled sarcoma.

common in the body of the uterus than in the cervix. It begins as a nodule in the deep part of the endometrium, and may grow either outwards and invade the muscular wall, or inwards towards the cavity. In the former case it has been known to penetrate right through the uterine wall and even invade the pouch of Douglas. Much more commonly, however, it grows towards the cavity, and the subsequent history

¹ *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, London, 1907-8, vol. i. pt. ii.

of the growth is closely analogous to the development of a fibroid polypus. Rarely growing larger than the fist, it may, like a polypoid submucous myoma, dilate the cervix and pass out into the vagina. During this process its surface generally becomes lobulated; it may easily become more or less strangulated; and portions may slough off and be expelled *per vaginam*.

In the cervix circumscribed sarcoma is more rare. In some cases it has taken the form of a mushroom-like growth, hard to distinguish clinically from a proliferative epithelioma. In other cases it becomes polypoid, like the corporeal form.

Histologically these growths do not differ from the diffuse endometrial sarcoma. Sometimes they are more fibrous in their structure, and may be taken on a superficial examination for simple fibrous polypi, or mistaken for cases of sarcomatous metaplasia of pre-existent fibroid polypi.

A special form of the circumscribed cervical growth—or at least a form deserving separate and special notice—is the so-called ‘grape-like sarcoma of the cervix’ or *sarcoma cervicis botryoides*. Arising in the superficial layers of the mucosa either in the cervical canal or on the *portio vaginalis*, this form of tumour grows out into the vagina as a group of polypoid masses, comparable to a bunch of grapes, and not unlike a hydatidiform mole of the chorion. It grows rapidly and may fill, and even distend, the vagina. It occurs alike in the earliest years of infancy, in adolescence and youth, and after the menopause.

The first case of the sort was described by Weber in 1867, but no particular attention was paid to the subject until the appearance of Spiegelberg’s paper in 1879, in which he described a case and labelled it “sarcoma colli uteri hydropicum papillare.” The growth sprang from the anterior lip of the cervix, and after repeated local excisions and the ultimate removal of the uterus, it again recurred, and the patient, a girl of seventeen at the time of its first appearance, died. Weigert examined the tumour and, to quote Whitridge Williams, found “that the cyst-like masses were covered by a single layer of cylindrical epithelium, and their interior composed of large round, spindle, and branching cells, which were separated from one another by clear spaces which were traversed by fine threads. In these spaces lymph-corpuscles were found, and between the cells thin-walled blood-vessels. In the more compact portions of the growth and in the pedicles of the ‘cysts,’ large cells without the clear ground substance were seen. The growth at first suggested a myxomatous sarcoma, but fresh specimens failed to give the characteristic mucin reaction with acetic acid. Spiegelberg accordingly concluded that the appearance was due to oedema, the result of stasis in the numerous lymph sinuses of the cervix.”

Subsequent to this other cases were recorded by Spiegelberg, by Kunert, Rein,

Pernice, and Munde, and controversy arose as to whether they should be regarded

as oedematous sarcomata or as myxosarcomata. Ultimately in 1892 Pfannenstiel described a case and suggested the non-committal term of 'grape-like'—*das traubige Sarcom*. It is now generally recognized that the cystic masses are indeed due to the oedematous infiltration of a rapidly growing sarcoma, which, springing from the superficial epithelium of the cervix, tends to adopt from it a papillary structure. As it grows out into the vagina it rapidly expands in that comparatively roomy space, and hence the grape-like formation.

Since the publication of Pfannenstiel's paper numerous other cases have been recorded, and in a number of them the growths were really mixed tumours, containing striped muscular elements, and hyaline cartilage. Recently an excellent specimen has been described by Hellier.¹ The tumour mass was as large as a foetal head and projected from the vulva. It arose from the posterior lip of the cervix by a fairly narrow pedicle. The grape-like masses were only present on the lower and



FIG. 210.—Grape-like sarcoma of cervix. (Hellier's case.)
The lower mass protruded through the vulva.

¹ *Journ. of Obstet. and Gyn. of Brit. Emp.*, 1914, vol. xxvi. p. 108.

anterior surface of the tumour, the rest of it being firmer in consistence. The microscopic appearances suggested myxosarcoma rather than an oedematous sarcoma. The 'grapes' were covered by a thin layer of squamous epithelium. In spite of free removal the patient died of recurrence within ten months.

III. SPECIAL FORMS OF SARCOMA AND MIXED TUMOURS

A very considerable number of uterine sarcomata must be swept into this group, and, while their special interest is mainly pathological, they require separate mention. For the most part their peculiarities are only recognizable on careful microscopical examination.

Several cases in which the tissues were stained by a dark pigment have been described as *melano-sarcoma*. One case, described by Whitridge Williams, in which there were metastases in the brain and other organs is an undoubtedly genuine example. In most, if not all, of the other cases, however, there is no sufficient evidence that the tumour was really melanotic, and the likelihood is that the staining was due to altered blood-pigment. Proust and Caraven's case has already been referred to under '*leiomyoma malignum*.'

Numerous cases of *myxosarcoma* have been described. Piquand believes that many of these were in reality oedematous tumours. Von Franqué and one or two others have, however, recorded indisputable examples of true myxomatous change in a uterine sarcoma.

Specimens of *lymphosarcoma* have been described by Gow, Wagner, Schlagenhauer and others. The tumours were very soft and contained a rich lymphatic plexus with numerous dilated spaces.

Sitzenfrey¹ has described a case of *lipomyosarcoma*.

True *angiosarcomata* have been described—that is to say, tumours partly sarcomatous and partly composed of newly formed blood-vessels. In many of the so-called angiosarcomata the term is really a misnomer—the sarcoma-cells merely having a perivascular arrangement as in a perithelioma, while the vessels themselves are not growing to an extent which warrants the term angioma. Some of these latter cases present on section a very alveolar appearance, and have been described as *alveolar sarcoma*. Occasionally the outermost of the cells clustering round a vessel undergo hyaline degeneration, leading to an appearance as of cellular cylinders running through a homogeneous matrix. Such a form of tumour is sometimes spoken of as a *cyllindroma*.

Cases in which glandular tissue has been found have been described as *adeno-*

¹ *Zeitschr. f. Geb. u. Gyn.*, 1910, vol. lxvii. p. 32.

sarcoma. The gland spaces are either the relics of ordinary endometrial glands, or else the sarcoma has originated in an adenomatous polypus. The term is therefore misleading.

Cartilage has been detected in uterine sarcomata justifying the term *chondrosarcoma*. Some observers believe this to be due to a metaplasia of the connective-tissue cells, but in other cases the tumour is more probably an example of a *mixed mesodermal tumour*. One such case was described recently by Murray and Littler as an instance of 'adeno-chondro-sarcoma.' Such cartilaginous elements have been noted in several specimens of the grape-like tumour of the cervix, as witness the records of Rein, Pernice, Pfannenstiël, and McCann. Puech and Massabau¹ record a grape-like tumour of the cervix as an 'adeno-fibro-myxo-chondro-sarcoma.'

Striped muscle-fibres have also occasionally been discovered in uterine sarcomata—*rhabdomyosarcoma*. In a recent paper Blair Bell² has collected seventeen cases of this kind of *mixed mesodermal tumour*. It is possible that they are really due to a displacement of the embryonic mesoderm from the lumbar region during early foetal life. Of these mixed mesodermal tumours the majority occur in the cervix. According to Herb³ only eight have been described in the body of the uterus. These were mostly in the tubal region or posterior wall, and, as it happens, all in parous uteri.

Carcinoma Sarcomatodes.—Tumours have been described from time to time which presented in different parts the characters of cancer and of sarcoma. Some of them were probably endotheliomata, which frequently show in parts a strikingly alveolar arrangement difficult to distinguish from carcinoma, while other parts are characteristically sarcomatous. Fischer-Defoy and Lubarsch were able in 1905 to admit thirteen cases as genuine examples of double malignant tumours, and Taylor and Teacher⁴ have recorded other six, four occurring in the body of the uterus. In certain of the cases they believe that the active growth of the carcinoma had brought about the origin of the sarcoma. This is particularly interesting in the light of Russell's⁵ demonstration that sarcoma may develop during the experimental propagation of an adeno-carcinoma in the mouse.

Method of Spread and Secondary Changes.—Uterine sarcomata spread by direct continuity and by the formation of metastatic deposits. The tendency for a sarcoma in one part of the uterus to invade the rest of the organ and to penetrate through into the peritoneal cavity has been referred to already. Several cases on record

¹ *Ann. de gyn. et d'obstét.*, 1908, vol. v. p. 306.

² *Loc. cit.*

³ *Surg. Gyn. and Obstet.*, 1910, vol. x. p. 463.

⁴ *Journ. of Pathol. and Bacteriol.*, 1909-10, vol. xiv.

⁵ *Ibid.*

of sarcoma, which apparently began in the endometrium, showed sarcomatous masses in the pouch of Douglas. The parametric cellular tissue has also been found to be heavily infiltrated in several cases, particularly of subperitoneal growths. Thus, for example, in cases recorded by Katz, Terrillon, v. Franqué, and Stallmann amongst others, the broad ligaments were filled with masses of malignant tissue—so much so in some cases as to cause compression of the ureters and hydronephrosis. At the same time this local involvement is not so common in cases of sarcoma as in cancer of the cervix, and the compression of the ureter is a rarity in sarcoma whereas it is not infrequent in cancer. In connection with the involvement of the parametrium mention may just be made in passing of two interesting tumours described by v. Franqué¹—one a *myoma sarcomatodes parametrii*, and the other a *myoma malignum diffusum parametrii*.

One peculiar feature in regard to the growth of uterine sarcomata is that for a long time the growth may be very slow, and then suddenly become much more rapid. In the case of sarcoma developing in a myoma this may probably be accounted for in part by the persistence of the capsule in the early stages.

The later stages of rapid growth are usually characterized by the occurrence of metastatic deposits. These are most commonly found in remote organs, such as the lungs, liver, and retroperitoneal glands. It is therefore obvious that the blood-stream is the main channel for the propagation of the growth, and indeed in several cases the pelvic veins have been found filled with long strings of sarcomatous thrombus. In one case of the sort recorded by Katz there were also sarcomatous emboli in the pulmonary veins. At the same time metastasis by means of the lymphatic vessels cannot be ruled out altogether, as is shown by certain cases of discontinuous involvement of the parametrium.

The sarcomatous growths commonly found in the vaginal walls in cases of cervical sarcoma are believed by many writers to be metastatic, but Gessner held that they are really instances of a direct spread. The same also applies to such cases as that of A. R. Simpson, in which the Fallopian tubes were affected by direct continuity, and thrombus-like masses projected from the fimbriated extremities.

In regard to the actual frequency of metastases, Gessner believed that they are much more common than is generally thought—a careful and thorough *post-mortem* examination being necessary to reveal their existence. The frequency of recurrence after operation certainly supports this view.

The occurrence of inversion of the uterus as a complication of sarcoma has been mentioned. In most cases the diagnosis of sarcomatous polypus was made—

¹ *Festschrift Rindfleisch*, 1907.

with immediately fatal results from the efforts to remove it. But the most interesting point is that in two cases, those of Simpson and Spiegelberg, the inversion occurred in a *nulliparous* patient. It was this extraordinary feature which suggested to Simpson the idea that the uterine wall in these cases must be exceptionally weakened by malignant infiltration.

The occurrence of pyometra and haematometra has also been mentioned in passing as a result of the cervical canal becoming obstructed by sarcomatous masses. Terrillon records such a case in which the uterus contained seven litres of fluid, and he refers to a case of Péan's in which there were fifteen litres.

With regard to the secondary changes in the tumours themselves little need be said. The frequent presence of areas of haemorrhage and of simple necrosis has been mentioned repeatedly. So also has the existence of cystic spaces. In many instances these are due to the dilatation of lymphatic spaces—lymphangiectasis. In others it is due to an accumulation of oedematous fluid, or is the result of necrosis. Hyaline degeneration is often found in uterine sarcomata, and true myxomatous degeneration much less frequently. Dilatation of blood-vessels is not uncommon, and thrombosis is a very usual precursor of necrosis and of the formation of cystic spaces of considerable size.

Etiology.—To all intents and purposes this paragraph might be omitted, for there is practically nothing known about the cause of sarcoma of the uterus. Apart from the wide questions connected with the origin of malignant tumours in general which cannot be touched upon here, there has been a good deal of effort made by some authors to throw the blame upon certain factors as predisposing causes. There is, however, no sufficient evidence to indicate that, for example, heredity plays any rôle in the cause of this condition in the uterus; and the same may be said about such conditions as the pre-existence of myomata, previous inflammation of the uterus, trauma either obstetrical or otherwise, partity, or sterility, against all of which indictments have been laid. In one or two rare instances the uterine tumour has been secondary to sarcoma elsewhere, as in the ovaries.

The age-incidence is really the only point upon which we have any clear evidence, and it is best indicated by the following graphic curve taken from Meyer. It will be observed that there is a slight relative frequency in infancy, and an interesting point about that is that most of these cases were examples of the grape-like sarcoma of the cervix. Another period of relative frequency corresponds to the years in which the uterus is assuming its adult functions—15 to 20. From 25 onwards there is a gradual increase in frequency, the greatest number of cases being found between the ages of 45 and 60, with an actual maximum round about 50. Thus

it appears that, speaking generally, sarcoma of the uterus is preponderatingly a disease of the period around the menopause.

Symptoms and Physical Signs.—The symptoms and signs of a uterine sarcoma are in no way pathognomonic, but are simply those due firstly, to a uterine tumour, and secondly, to its malignant nature. In the latter group we find the symptoms common to any malignant tumour—cachexia, a tendency to invasion of neighbouring organs and to the formation of metastases in more distant ones.

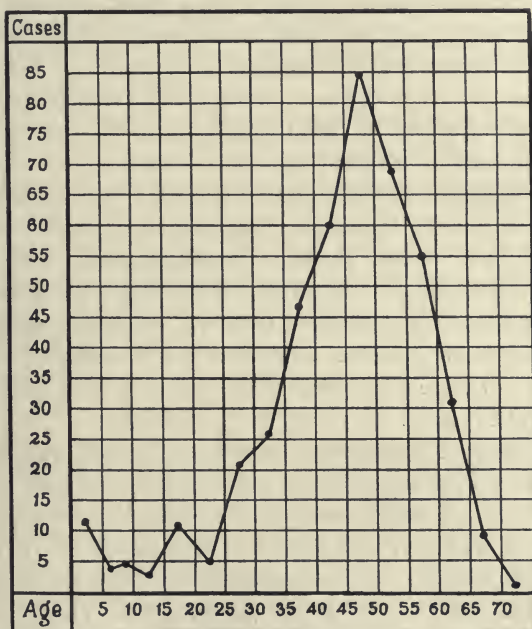


FIG. 211.—Curve indicating the age-incidence of sarcoma of the uterus. (Adapted from Meyer.)

In the former the symptoms and signs vary according to the site and to the pathological anatomy of the particular sarcoma. Thus while haemorrhage, pain, white or watery discharge, and pressure on neighbouring organs constitute practically all the local symptoms, the actual sequence or combination of them in any given case varies widely with the pathological anatomy of that case. For example, a circumscribed sarcoma of the uterine wall may for long give rise to no symptoms except menorrhagia and enlargement of the uterus. When, however, it invades the mucosa, and especially if it become polypoid, it will give rise

to much more serious bleeding and to pain, and ultimately to a more or less foul watery discharge in the intervals between haemorrhages. At the same time the malignant nature of the growth may evince itself in a cachexia incongruous in degree with the amount of blood lost or with the presence of a mere myoma.

Sarcoma of the Uterine Wall.—In these cases the train of symptoms is closely analogous to that of a myoma, the most noticeable being haemorrhage and pain. Haemorrhage is almost invariably the first sign. In subperitoneal tumours it takes the form of a slight menorrhagia, but the more a growth becomes submucous the more severe the bleeding, until ultimately it becomes almost incessant. The beginning of the haemorrhage may be insidious—a gradually increasing menorrhagia followed in the end by a metrorrhagia, which, if the patient be at the menopause, becomes worse instead of better. The insidious and slow onset corresponds to the slow initial development of the growth, or to its originating in a myoma. In other cases the haemorrhage first shows itself as a recurrence of bleeding after the establishment of the menopause. In the later stages any intervals between haemorrhages are characterized by a watery discharge, which frequently contains *débris* and fragments of tumour-tissue, and ultimately becomes foetid and purulent.

Pain is least marked in interstitial tumours. In subperitoneal growths it is often severe owing to the associated peritonitis and formation of adhesions. Submucous tumours also cause pain owing to the expulsive contractions of the uterus which they are apt to set up.

The physical signs of interstitial or submucous tumours are a uniform enlargement of the uterus, with a consistence considerably softer than in the case of a 'healthy' fibroid, and sometimes tender on pressure. Subperitoneal growths cause irregular bossing of the uterus with areas of varying softness due to the tendency to degeneration of the tumour. As the masses enlarge they may fill the entire pelvis and even encroach upon the abdominal cavity, causing pressure-symptoms and ascites. A uterine souffle is often audible, especially in telangiectatic growths.

Sarcoma of the Endometrium.—This condition gives rise to haemorrhage, a watery discharge ultimately becoming purulent, and pain—the same triad of symptoms as cervical carcinoma. The bleeding may begin in exactly the same ways as in the previous group, but tends much more rapidly to become almost continuous. Pain is a late symptom. It becomes greatly aggravated when portions of the growth become pedunculated, or when the growth, eating through the muscle as it occasionally does, invades the parametric tissue. The pains set up by portions of the growth becoming polypoid are characterized by severe exacerbations, usually occurring irregularly, but sometimes showing a strange rhythmic periodicity. This pheno-

menon was pointed out by Sir James Simpson in connection with cancer of the body of the uterus. As has already been mentioned, the expulsive crises which occasion these pains sometimes lead to inversion of the uterus.

The only physical sign is a uniform enlargement of the uterus, which is soft and rather like a pregnant uterus in consistence, although it may vary in different parts if degenerative cystic spaces are present. Except in the advanced stages the uterus remains movable, and the cervix rarely shares in the enlargement. Howard Taylor¹ records an interesting instance of a 'silent' sarcoma. The patient had no symptoms or signs beyond the enlargement of the uterus. This was of the size and consistence of a seven-months' pregnancy, and the patient had to be watched for some weeks to exclude that diagnosis.

Sarcoma of the Cervix.—The most striking feature of sarcoma of the cervix is the extraordinary silence of the growth, in many instances, during the greater period of its development. Numerous cases have been discovered more or less accidentally. In Pernice's case the growth was not discovered until it had entirely filled the vagina and was beginning to bulge through the vulva, while in a case recorded by Thomas, the patient, with a very similar condition, complained only of difficulty in coitus.

More commonly, however, the tumour begins to break down before it has reached such an advanced stage of development, and haemorrhage and watery discharge are the symptoms which usually draw attention to it. In some cases the bleeding is very copious and may produce a profound anaemia. Pain ensues somewhat later, and, as in cervical cancer, is usually insignificant in degree until the disease spreads beyond the cervix and invades the parametric cellular tissue. When the tumour is large and fills the vagina, there are symptoms of pressure on the rectum and bladder, and a feeling of weight and distension in the perineal region.

The physical signs are much earlier and more readily discernible in cervical sarcoma than in corporeal. At first all that can be detected is enlargement of the cervix, but later the various forms of cervical growth may be made out. The diffuse form takes the shape of an irregular soft vegetative mass, only distinguishable microscopically from a proliferative epithelioma. The polypoid form may be readily felt, but again only the microscope may be able to distinguish it from a fibroid polypus. The grape-like form is much more distinctive, forming a mass not unlike a hydatidiform mole.

Diagnosis.—In all cases this is beset with difficulties. In almost all it is impossible to form more than a shrewd suspicion as to the nature of the condition without recourse to the microscope or until after operation.

¹ *Amer. Journ. of Obstet.*, 1907, vol. lvi., and 1909, vol. lix.

The main difficulty is the close similarity of the symptoms to those of a myoma, combined with the fact that the latter is so overwhelmingly more frequent. In the case of sarcoma of the uterine wall this applies with especial force, and when it is recalled that probably the majority of uterine sarcomata originate in pre-existing myomata the impossibility of an exact diagnosis becomes obvious.

The first point of practical importance is that the symptoms of any form of degeneration in a myoma should be regarded with suspicion, since it is impossible to distinguish clinically between sarcomatous metaplasia and necrobiosis or even marked 'myxomatous' degeneration. These symptoms are unduly rapid growth and enlargement, and marked softening of the tumour, pain in and perhaps tenderness over the mass, and frequently a sudden increase in the bleeding, or a recurrence of bleeding after the menopause.

In addition there are certain clinical features that should bring any supposed simple myoma under the gravest suspicion. These are the presence of a watery or sero-sanguinolent discharge in the intervals between haemorrhages, any undue severity of the pain, the existence of cachexia, or of an anaemia more profound than is to be explained by the blood-loss, and lastly the presence of ascites.

All these points are summed up in a number of plain rules which are briefly as follows. In the case of any uterine tumour simulating a myoma the existence of sarcoma ought to be suspected :

- (1) When the supposed myoma increases rather than diminishes in size after the menopause.
- (2) When the haemorrhage recurs after the definite establishment of the menopause.
- (3) When the supposed myoma is accompanied by cachexia not otherwise accounted for, or by an anaemia not explicable by the degree of haemorrhage.
- (4) When the supposed myoma gives rise to symptoms of pain or discomfort not explicable either by its size or its situation.
- (5) When the supposed myoma is accompanied by ascites.
- (6) When the supposed myoma undergoes rapid growth or softening.
- (7) When the removal of a supposed myomatous polypus is followed by recurrence.

In sarcoma of the endometrium confusion may arise with submucous myoma and carcinoma of the body of the uterus. A fibroid polypus, particularly if it is becoming gangrenous, will give rise to exactly the same symptoms ; so also may cancer of the body. The possibility of endometritis, especially the senile form, of tuberculosis of the endometrium, and of chorionepithelioma must also be kept in

mind. In tuberculosis the family history and previous health, and the existence of tuberculosis elsewhere in the body may be suggestive. In chorionepithelioma the patient's obstetrical history will probably be helpful towards diagnosis. In all cases a microscopical examination of curetted fragments of endometrium should be made by a competent observer before a definite diagnosis is reached. The significance of recurrent 'fibroid' polypi, and the importance of examining all such, especially towards their bases, have already been emphasized.

In cervical sarcoma the employment of the microscope is scarcely less necessary to confirm the diagnosis. Benign polypi, both fibroid and adenomatous, must be excluded. Cancer of the cervix may often be clinically indistinguishable from sarcoma. In the case of the grape-like sarcoma the possibility of a hydatidiform mole in the process of extrusion must not be forgotten.

Duration and Prognosis.—The duration of the disease is so extremely variable that it is questionable if any general statement can be of much value. It would appear, however, that the endometrial form of sarcoma is the slowest in its development, the average duration of a number of cases being about three years. The extremes are a few months on the one side, and as much as eight to ten years on the other. Cervical sarcoma seems to take a slightly shorter time to run its course, the average being about two and a half years. Exception, however, must be made of the grape-like form, which seldom takes more than eighteen months to progress to a fatal conclusion.

It is frequently quite impossible to make any estimate as to the duration of a sarcoma of the uterine wall; especially of one which develops in a myoma, as it is not possible to say when exactly the sarcomatous change began. Piquand gives two and a half years as the average duration, but the true muscle-celled sarcoma probably takes longer to reach a fatal termination. Round-celled forms are believed to be more malignant and rapid in their growth than spindle-, muscle-, or mixed-celled, and the true giant-celled tumour, while rare, is the least malignant.

Death results in most cases from cachexia, from septic absorption, and from enfeeblement due to repeated haemorrhages. Metastatic deposits, pressure upon neighbouring organs, and secondary changes and necrosis in the tumour frequently hasten the end.

The *prognosis* of uterine sarcoma is therefore extremely grave, and unfortunately it is not so greatly improved by operative interference as might be hoped. This is, of course, owing to the fact that often the diagnosis is not made until after metastatic deposits have begun to form. As might be expected, the best results are obtained in cases where the sarcoma has developed in a myoma, the initial

encapsulation of the growth and the possibility of its wide removal by panhysterectomy affording a better chance of escape from metastases. In such cases the probability of recurrence after operation is much the same as in cancer of the body of the uterus. In all the other forms it is very considerably higher.

Treatment.—But little need be said on this subject. The ideal treatment is the radical removal of the uterus and its appendages as soon as possible after the diagnosis has been made, even provisionally. For this the abdominal route gives much the freer and better access. The technique of the extended panhysterectomy employed for cancer of the cervix should be followed to a great extent, and attention to the lymphatic glands should not be omitted, as they may be infiltrated with sarcoma-cells. The complete closure of the vagina and the subsequent removal of as much of it as is indicated, are just as important in operating for sarcoma as for cancer.

Contra-indications to operation are the direct extension of the disease to neighbouring organs, the presence of metastatic deposits in more distant parts, the advanced spread of the disease into the pelvic cellular tissue, and a condition of general septic absorption. Ascites in itself need not necessarily be a contra-indication, while the degree of anaemia which renders an operation inadmissible depends to some extent on the skill and experience of the operator.

IV. ENDOTHELIOMA OF THE UTERUS, INCLUDING PERITHELIOMA

In the last twenty years, and more particularly in the last decade, numerous tumours of the female generative organs have been described under the name of *endothelioma* (or *mesothelioma*). Several of these have been solid ovarian tumours, but more than a score have been recorded as occurring in the uterus, and in pre-existing myomata.

As a matter of definition an endothelioma is a tumour originating from endothelium, either serous or vascular. Tumours of the serous membranes such as the pleura or peritoneum (which alone should be termed *mesothelioma*) are rare, but the dura mater is not uncommonly affected. In the case of the uterus, however, a vascular origin only is claimed for these tumours. Obviously there may be two varieties of this—from the blood-vessel endothelium or from the lymphatic endothelium. Corresponding to these there are the two forms of tumour—haemangio-endothelioma and lymphangio-endothelioma. A special form of the latter, arising from the perivascular lymphatics, has received the name of perithelioma.

The characters claimed as typical of an endothelioma are as follows. Macroscopically they are indistinguishable from sarcoma or carcinoma. Microscopic sections exhibit whorls of epithelioid cells arranged concentrically, with more

or less fibrous stroma between the cells. The centre of the whorls is in many cases a space, which may contain blood or may be empty. If it contain blood it is probably the lumen of a capillary, and the tumour is a haemangio-endothelioma. If the space be empty it is regarded by exclusion as a lymphatic, and the tumour as a lymphangio-endothelioma. In other areas the lumina of the vessels may be occluded by the growth of the cells, the centres of the whorls being made up of loosely packed cells which often show hyaline changes. When the whorls are cut obliquely they appear oval or elongated.

This curious appearance is due to the growth of the endothelial cells, and in favourable sections it may be possible actually to see the transition stages between the typical flat endothelial cell and the rounded or cuboidal tumour-cell.

In a typical section of a *perithelioma* there are similar whorls, but in the centre of each the blood-vessel is quite recognizable as such, its walls remaining intact and lined by normal endothelium. The tumour cells are arranged round it in rows radiating at right angles from the long axis of the capillary vessel.

Amongst pathologists there is still much debate as to the exact nature and

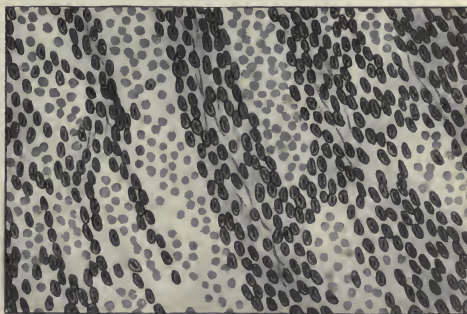
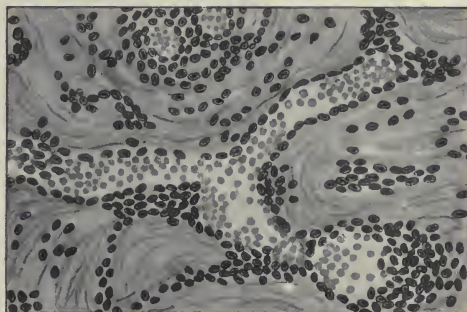
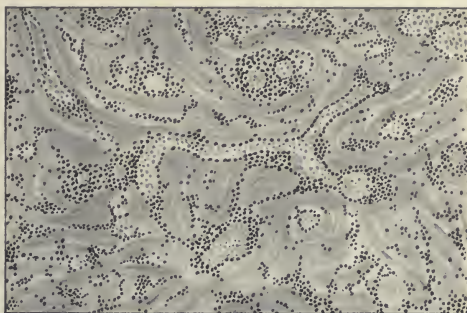


FIG. 212.—Endothelioma of the uterus, under low, medium, and high powers. (After Hansen.)¹

In *b* the origin of the tumour-cells from the endothelium is well seen. In *c* the malignant cells are spreading diffusely, giving a sarcomatous appearance.

¹ Virchow's *Archiv*, 1903, Bd. 171, p. 18.

histogenesis of these tumours. It is probable that in any one case much depends upon the areas examined, for in most of these tumours there seem to be regions which are characteristically sarcomatous and others which are equally suggestive of carcinoma. Many of the Germanic writers deny the endothelial origin altogether, and regard the tumours as of the nature of alveolar sarcoma, or in some cases as carcinoma. Adami,¹ Ritchie² and others, on the contrary, maintain the possibility of an endothelial origin. This brings them into the category of malignant tumours arising in tissues of mesoblastic origin, and accordingly they are conveniently considered along with sarcoma. Thus Beattie³ in describing the structure of an endo-

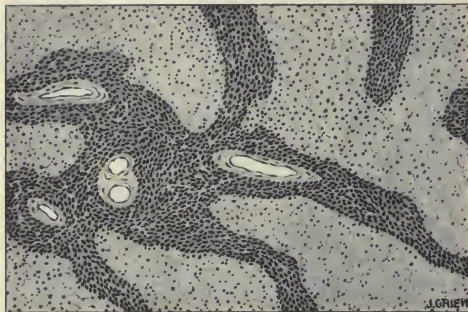


FIG. 213.—Perithelioma of the uterus (L.P.).
The endothelium of the vessel walls is unaffected.

thelioma arising in a myoma removed by Miles Phillips points out that "the primitive mesoblast becomes differentiated into mesothelium and mesenchyme, and it is from the latter that the endothelium of blood-vessels and lymphatics as well as the fibrous connective tissue and the unstriated muscular tissue arise. Thus both sarcoma and endothelioma take origin from this mesenchyme—the former probably at an earlier and more primi-

tive stage of development. It is not surprising therefore that in a malignant new growth arising from endothelium there should be at parts a reversion to the more primitive sarcomatous structure."

Into the arena of controversy it is impossible to enter here, but it is only right to indicate the obscurity which surrounds the true nature of these tumours. Moreover, it must be said, although with reluctance, that in all probability a number of the tumours recorded as endotheliomata might with as much reason be described as sarcomata or carcinomata as the case may be. When in difficulty between these two diagnoses the pathologist, nowadays, seems prone to seek refuge in the diagnosis of endothelioma.

Accepting the recorded cases as they stand, we find that the great majority are tumours of the cervix. Donald⁴ and Haultain⁵ have, for example, recorded cases

¹ *Principles of Pathology*, 1909.

² *Journ. of Obstet. and Gyn. of Brit. Emp.*, 1908, vol. xiii. p. 103.

⁴ *Ibid.*, 1914, vol. xxv. p. 44.

² Pembrey and Ritchie, *General Pathology*, 1913.

⁵ *Trans. Edin. Obstet. Soc.*, 1913-14, vol. xxxix.

of reputed endothelioma of the cervix within recent years. From the frequency of its situation in the cervix some observers have suggested that it may originate in the relics of Gartner's duct, but for this view there does not appear to be much evidence.

Few undoubted cases of endothelioma have been described as originating in the body of the uterus. Jellett¹ has shown a uterus with several 'sarcomatous'

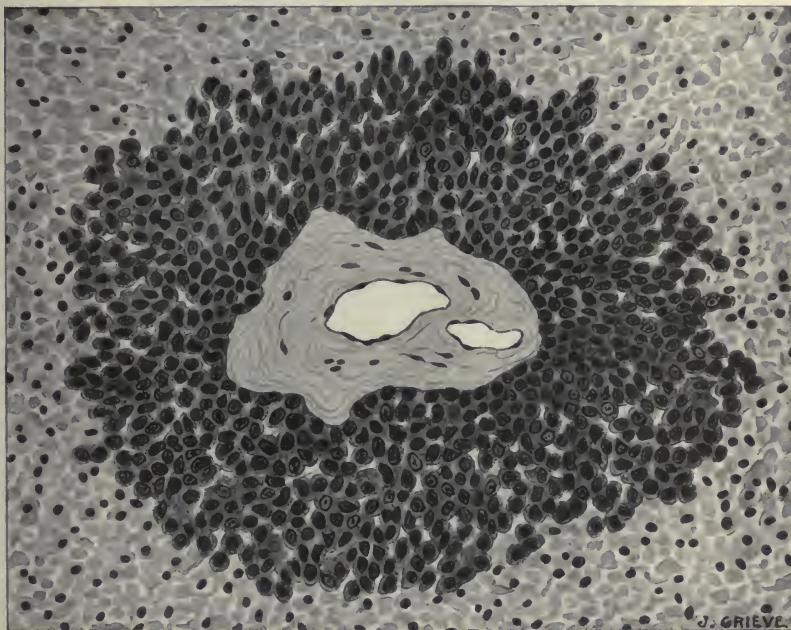


FIG. 214.—Perithelioma of the uterus (H.P.). The cells show the appearance as of rows radiating from the vessel at right angles to its long axis.

nodules in the wall and one in the ovarian ligament, in which there appeared to be evidence of an endothelial origin. Dorland² has recorded a perithelioma of the fundus, and McWeeney and Gibson³ have described a case of sarcoma and endothelioma occurring in the one uterus. Barbour and Watson⁴ have recorded a perithelioma of the body of the uterus as large as a five-months' pregnancy (Fig. 215).

¹ *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, London, 1910, vol. iii.

² *Journ. of Amer. Med. Assoc.*, 1908, vol. li, p. 1227.

³ *Journ. of Pathol. and Bacteriol.*, 1907-8, vol. xii, p. 132.

⁴ *Trans. Edin. Obstet. Soc.*, 1910-11, vol. xxxvi.

On the other hand several instances have been recorded of the condition arising as a 'degeneration' of a myoma. Phillips' case has already been mentioned.

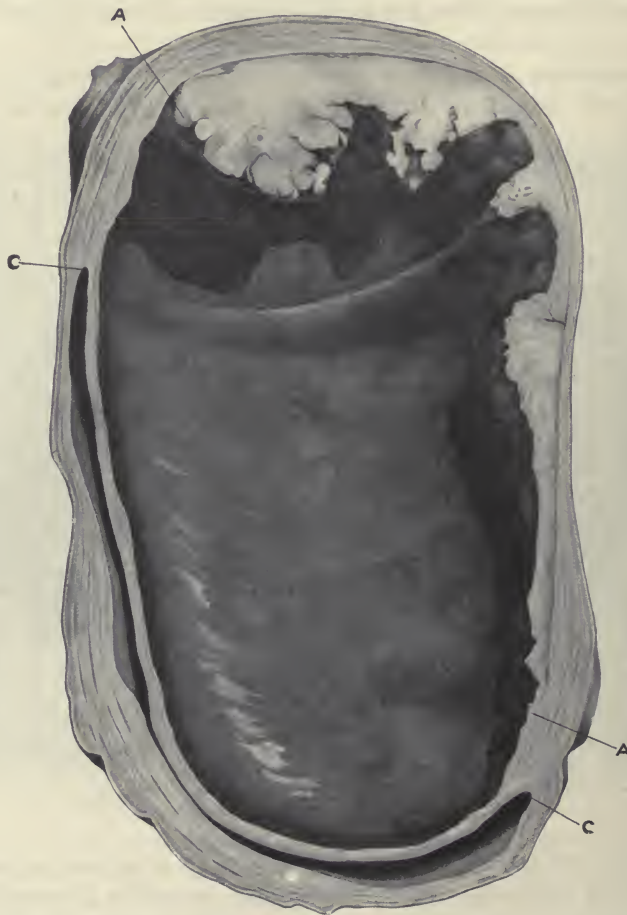


FIG. 215.—Cystic myoma with peritheliomatous masses (about $\frac{1}{3}$ nat. size). (Barbour's case.)
A—A, perithelioma affecting cyst-wall; C—C, cavity of uterus.

A specimen removed by Carlton Oldfield is illustrated (Fig. 216), as also a remarkable tumour operated on by Barbour¹ (Plate XXVII.). This was a myoma containing a cyst as large as a melon, filled with altered blood, in the wall of which there were

¹ *Journ. of Obstet. and Gyn. of Brit. Emp.*, 1913, vol. xxiv. p. 61.



Perithelioma of the body of the uterus (Barbour's case). The growth, which contains large hæmorrhagic and necrotic areas, has almost destroyed the entire thickness of the uterine wall at the fundus.

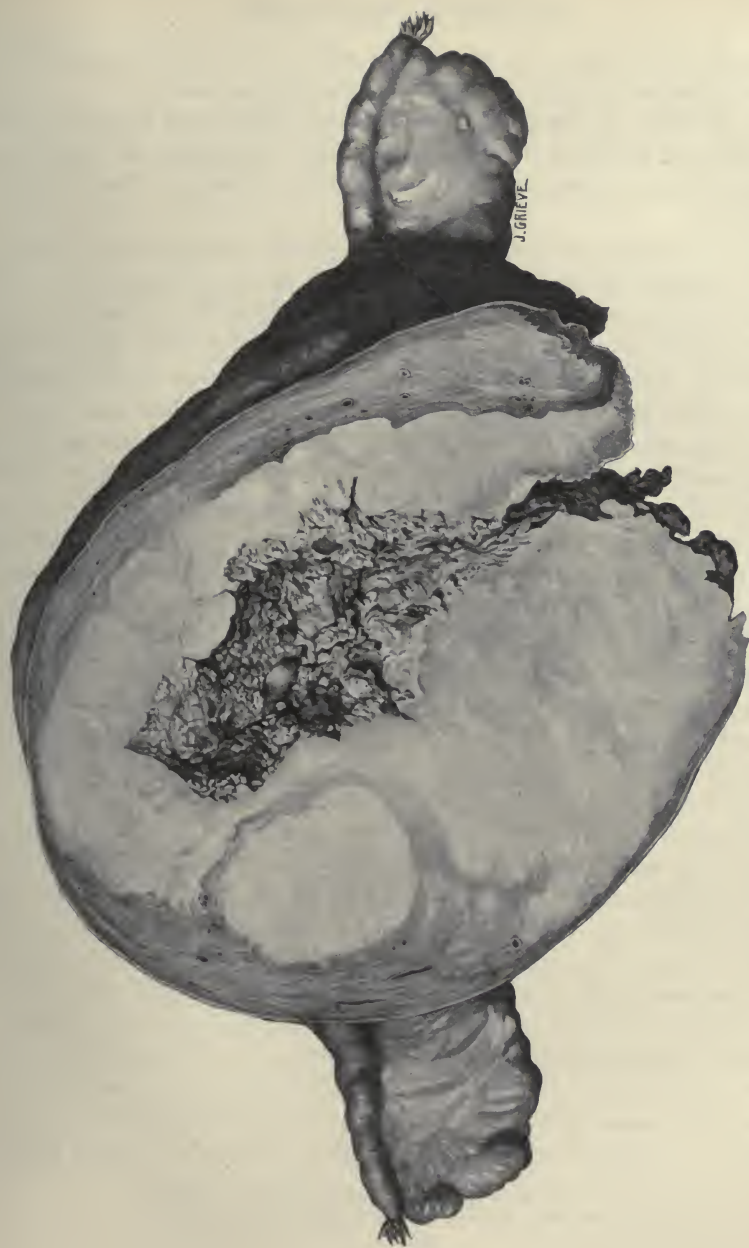


FIG. 216.—Endothelioma of the uterus, affecting diffusely both mucous and muscular tissue (about $\frac{1}{3}$ nat. size). (Carlton Oldfield's case.)
The history of the case suggested that the growth probably began in a pre-existent myoma.

several masses that proved on microscopical examination to be typical perithelioma. Doran and Lockyer¹ have described two somewhat similar cases.

The *symptoms* and *signs* of endothelioma are identical with those of sarcoma in corresponding situations. The *diagnosis* is purely histological, the macroscopic appearances being indistinguishable from sarcoma or carcinoma. The *treatment* is free removal.

Only in the *prognosis* do they differ from ordinary sarcomata, and in this they appear to compare favourably. The malignity of the growths seems to be relatively low, and the chances of recurrence after removal decidedly less than in sarcoma. Doran's and Lockyer's cases are remarkable instances of this point. In one a large cystic myoma, with peritheliomatous changes in it, was removed by subtotal hysterectomy, and the patient was alive and well at least four and a half years later. In the other there was a cystic uterine myoma with perithelioma in it, invading the left broad ligament and mesocolon, the parametrium being infiltrated with presumably malignant tissue. The left ovary also contained peritheliomatous masses. Complete removal of the uterine mass was impossible and speedy recurrence was confidently expected. The patient, however, recovered and showed no signs of recurrence after more than two and a half years.

Whether there is any difference in the malignity of ordinary endotheliomata and of peritheliomata we have not sufficient data to say.

¹ *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, London, 1908-9, vol. ii, pt. ii.

CANCER OF THE UTERUS

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PART I

INTRODUCTION

THE malignant diseases of the uterus comprise carcinoma, sarcoma, endothelioma, perithelioma, and chorionepithelioma. Occasionally more than one variety of malignant disease exists side by side in the same uterus. Thus sarcoma and carcinoma have been observed together, as in a case discussed by Spencer,¹ and recent experiments on mice have suggested the essential unity of these two new growths. In certain transplantable mouse-cancers propagated through many generations, sarcomatous tissue suddenly appeared between the alveoli of the carcinoma, and replaced part of the original stroma.² As the tumour was passed through other series of mice it gradually became a pure sarcoma. That the tumours were not merely infective granulomata was shown by the occurrence of metastases. There was no evidence of direct transformation of cancerous into sarcomatous elements, but it was suggested that the development of sarcoma may possibly be explained as a new and altered form of specific reaction of the connective tissue to stimuli proceeding from the epithelial cancer-cells. These experiments are of the greatest interest and importance, but much more investigation is necessary before the exact relations between the two forms of malignant disease are finally determined. In the meantime it has appeared desirable in this work to consider separately uterine sarcoma and the allied tumours, and also by reason of its special clinical and pathological relations to devote a special chapter to Chorionepithelioma. The present

¹ Spencer, *London Obstetrical Transactions*, 1905, vol. xlvii. p. 338.

² Haaland, *Imperial Cancer Research*, Third Scientific Report, p. 175.

article, therefore, deals solely with the *carcinomata*, which form by far the most numerous class of the malignant new growths found in the uterus.

Cancer is a new growth which originates in epithelium and has a distinct alveolar structure; it grows without limit, infiltrating and destroying the organs or tissues in which it originates, spreading beyond their limits, and paying no respect to anatomical boundaries. It forms metastases in the neighbouring lymphatic glands, and may be conveyed to any part of the body by means of the lymph- or blood-circulation.

The consideration of cancer as it affects the uterus must of necessity take note of the actual position of knowledge of cancer in general. The present theory of cancer is founded on clinical observation; on the study of anatomy, coarse and microscopic; on the investigation of the chemistry and biology of the new growth and of its host's metabolism; on the examination of statistics; and on animal experiments. Questions so numerous and complex arise in connection with the research that it would appear impossible for any individual to grasp the subject in all its bearings, and the genius has not arisen who shall see into the heart of the matter and render a complete and satisfactory theory, such as has been done, for instance, in the case of the germ-theory of infective diseases.

Meanwhile in the course of the last few years patient and unwearying research, especially by the help of experiments on animals, have made clear much that was formerly obscure. It is known that cancer always begins either in, or in close association with, epithelium; that its epithelial constituents are the essential part of the tumour; and that these cause the surrounding connective tissues to form the vascular and supporting stroma. Once a cancer has begun to grow it is capable of perpetual proliferation, and may live much longer than the subject in which it took its origin. In illustration of this is the fact that one mouse-tumour has been grown for nine years and has passed through one hundred and sixty-six successive batches of mice.¹

The cancer-cells differentiate little and irregularly, though variations are found even in the same tumour. The cells multiply without purpose or effect; they neither secrete nor form an impermeable covering, nor undertake any useful office. That cancer-cells may remain latent in the body for many years is proved by instances of late generalization and by innumerable cases of late recurrence after operation.

In the human subject cancer frequently exhibits cyclical changes in its development; at one time growth is rapid, at another slow; sometimes the tumour appears to cease growing or even to retrogress. This periodicity appears to be a fundamental

¹ Bashford, *Lancet*, 1910, vol. i. p. 266.

property of cancer, and is illustrated in many ways in mouse-tumours. Experiments with the same mouse-cancer show a varying rate of growth from time to time, varying percentages of successful inoculation, and varying susceptibility of the tumour-cells to dosage.¹ The histological structure similarly shows great variations; some transplantable tumours are constant in their structure; others show great alterations, being alveolar at one time, acinous at another, and returning again to alveolar.² The varying structure in different specimens of uterine cancer, and in different parts of the same specimen, recalls vividly this last peculiarity.

As soon as a sporadic cancer has begun to grow, its epithelial cells behave as independent parasites. Its metastases are formed by the growth of living cells that become detached from the original tumour. When it is inoculated into another individual the success of the inoculation depends on the transference of the living cancer-cells; the transplanted tumour retains the original type. During the development of the tumour no toxins are formed, neither does the organism react by forming specific antibodies. Cancer is thus distinguished from the infective granulomata, in which the lesions grow from the connective tissues of the host, form toxins, and cause the formation of antibodies.

The relation of the new growth to its host appears to be analogous to that between the foetus and its mother. The growth stimulates metabolism, leading to enhanced activity of all the organs, digestive, respiratory, and glandular. Thus in the early stages the nutrition of the host not merely does not deteriorate but is often found to be improved; only later the organs cease to respond to the stimulus, and then the tumour begins to live at the expense of the host, which soon dies of exhaustion.³

Theories of Origin of Cancer.—The old battle about the local or general origin of cancer has been decided, and now there is practical unanimity in the view that in its beginning cancer is a local affection.

The exact process of inception is still wrapped in obscurity, and there are two sets of hypotheses, each with strong supporters. The first set of observers believe with von Hansemann that the primary change consists in anaplasia of some of the epithelial cells already present in the body, characterized by irregular mitosis and pluripolar division, by independence of growth, and power of limitless proliferation. The other set hold that the origin of cancer depends primarily on changes in the subepithelial connective tissue, and point out that at the sites of most carcinomata there is evidence of old connective-tissue changes which have often persisted for

¹ Bashford, *Imperial Cancer Research*, Second Scientific Report, pt. ii. p. 55.

² Gierke, *Imperial Cancer Research*, Third Scientific Report, p. 115.

³ Murray, *Imperial Cancer Research*, Third Scientific Report, p. 103.

many years. These changes are only found round early cancers ; in the neighbourhood of advanced tumours there are none of the signs of pre-existent inflammation, and there is no cell-proliferation.

The exact manner in which the connective-tissue changes originate the characteristic epithelial overgrowth of cancer is sought to be explained in various ways. According to Cohnheim the change leads to a diminution of physiological resistance, enabling the epithelial cells to penetrate and destroy ; Ribbert speaks of a disturbance of 'tissue tension' of the part, which may be due to inheritance giving rise to irregularities in development, to the atrophy of old age, to trauma, or to the result of inflammatory changes. A tumour originates in a collection of cells, or piece of tissue which has become separated from its organic connection with the surrounding parts ; the carcinomatous area enlarges by successive conversion of non-malignant epithelium, incited by the connective-tissue changes, until the entire pre-carcinomatous area is used up. Thereafter there is no further conversion, but continued growth is due to proliferation of the mass already formed.

Theories of Ultimate Causation.—With regard to the ultimate causation of cancer there are two distinct schools of thought representing those who more or less vaguely believe in a parasitic etiology, and those who regard such an etiology as quite incompatible with the natural history of the disease. Cancer occurs in all mammals, birds, reptiles, and fishes, and in all the races of mankind. Its incidence is universal but not uniform in all the families of vertebrates, and the final cause is therefore not limited to mankind. This wide extension of the disease has been claimed as evidence both for and against its dependence on an extrinsic cause.

Extrinsic Theories.—The supporters of the parasitic theory point out that cancer runs a definite course, becomes disseminated, and leads to constitutional disturbances and death, just as do chronic infective diseases such as syphilis and tubercle. The constant primary local origin in any situation of the body, the invariable extension by auto-infection as shown by widespread metastasis, and the constant relation to some condition precedent causing diminished resistance of the part affected, are claimed as arguments in favour of a parasitic causation. Moreover, innumerable coincidences point to infection ; for example Whitehead observed epithelioma of the lip in father and son who used the same drinking vessel, and Budd related the case of a gentleman with cancer of the lip who transferred the disease to the tongue of a terrier who was in the habit of kissing him. Many observations have shown that in certain localities cancer occurs too frequently for mere coincidence, and houses in which two or three cases of the disease have arisen are also so numerous as to be suggestive. Again, direct contact-infection is known to be not uncommon

in certain forms of the disease, as, for instance, in cancer of the vulva, vocal cords, lips, and jaws, and in the peritoneal cavity. In these cases infection is due to the transference of living portions of tissue and may be compared to the process of skin-grafting. At operations infection by instruments is by no means uncommon, as illustrated by stitch-hole cancer, by multiple local metastases following breast operations, and by implantation metastases in the incision in abdominal operations, and in the vagino-perineal incision in the extended vaginal hysterectomy for uterine cancer. These cases of contact and implantation infection suggest that a patient in whom cancer is already growing is less immune; the power of resistance diminishes as the cancer develops. Cases in which the disease has been directly transferred from one human individual to another are more open to criticism, but that such a phenomenon is not inherently improbable is suggested by the countless successful inoculations in animals.

Multiple primary cancer is by no means uncommon under certain conditions; it is observed in cancer of the two breasts, in the intestines, the lips and the tongue, and the uterus; and is particularly apt to occur in skin-cancer arising on X-ray burns, lupus, and Kangri irritation.

It appears that there is much circumstantial evidence pointing to the parasitic origin of cancer, and the supporters of this theory point out that all specific diseases except cancer are exogenetic; and further that the spirochaete of syphilis has only recently been discovered, and that the germs of smallpox and vaccinia, for instance, are still unknown. The suggestion is made that the infective agent in cancer is probably a microphyte or microzoon conveyed in a tissue-cell; if this were so the great variety of primary cancer could be explained since the action of the germ would be different from that of the implanted cell, and possibly the cancer-germ might show varieties, just as for instance do the pyogenic organisms.

Numerous announcements of the discovery of cancer-parasites have been made from time to time, and among them may be mentioned Plimmer's blastomyces and Russell's fuchsin bodies, which are probably to be explained as inclusion-bodies due to degenerations of various kinds, leucocytes and occasional red blood-cells, or particles of chromatin or other substances due to rapid and irregular division of cells. Sanfelice found in malignant tumours of men and animals pathogenic saccharomycetes which could rarely be cultivated, since they were transformed into Russell's atoms by the action of an antibody existing in the serum of the infected animal; he prepared an anti-serum and employed it in dogs with good effects. Ford Robertson has described a group of protozoan organisms to be classed among mycetozoa, and Doyen has not only described a specific *micrococcus neoformans* but has prepared

from it a curative vaccine. None of these supposed parasites have stood the test of confirmatory observations, and it is to be admitted that if cancer is due to an extrinsic cause that cause is still to seek.

Various affections that have been classified with cancer have from time to time been proved to be due to external causes and have thus become shunted into the granulomata. Thus Fibiger has shown that a certain new spiroptera is in intimate relation with gastric carcinoma in the rat, and that the cockroach is the intermediate host. *Bilharzia haematobia* may be instrumental in causing vesical carcinoma. The adenocarcinoma of trout in hatcheries is probably a thyroid hyperplasia and due to infection.

Intrinsic Theories.—The upholders of the theories of intrinsic causation object that the external causative agent is not only undiscovered, but that one cannot exist, since there is no known instance of an external cause or germ that spontaneously attacks and produces its characteristic pathological effects in all vertebrates. Further, no parasite is known capable of producing primarily a proliferation of cells; the first effect is always injury and destruction, and the reaction against all parasites is a defensive inflammation. Pearce Gould¹ emphasizes the point that while the recognized infective diseases are specific in their structure and in their cause, cancer is not specific in structure and perhaps not in cause, while it is specific in its biochemical characters. Individual cancers take the biological peculiarities of the animals in which they occur, and are specific in the same sense as muscle, liver, and the other organs and tissues. The disease can be transferred from host to host, but only with great difficulty to an animal of another species. Sporadic cancer always retains, more or less, the marks and limitations of its cellular parentage from squamous, columnar, or spheroidal epithelium. In all cases where cancer is inoculated either in another situation in the same individual, or into another individual, the infective agent is the cell; there is no transformation of one kind of cancer into another, but the grafts are metastases and always show the same structure as the parent tumour. Metastases and cachexia are occasionally produced by numerous other tumours, e.g. certain fibromata, myxomata, enchondromata, and myomata, that differ from cancer in their histology and genesis, and cannot conceivably be due to the action of parasites. And finally, the supporters of the intrinsic theories cannot conceive that certain types of cancer, e.g. melanotic epithelioma of eye or skin, certain primary cancers of bone, and chorionepithelioma, can be due to a characteristic parasite, and roundly assert that the parasitic theory finds no support from statistical, epidemiological, experimental, or clinical research.

¹ Pearce Gould, *Lancet*, 1910, vol. ii. p. 1665.

PART II

THE INCIDENCE, ETIOLOGY, AND VARIETIES OF UTERINE CANCER IN GENERAL

In this country, among individuals of the age of 35 and upwards, one male in every twelve and one female in every eight dies of cancer.¹ In the female the uterus is the site in nearly 30 per cent of the total number of cancers; so that among women living at the age of 35 and upwards one in every twenty-seven, or nearly 4 per cent, will eventually die of cancer of the uterus.

Cancer occurs in all races of mankind. In the uterus it has been found in every continent, and almost in every part of each continent. The old impression that in America it was relatively less common in negroes than in white women has disappeared with increasing knowledge. Still nothing is known as to the proportional frequency in different races and peoples. The influence of climate and topography on the incidence of cancer; the existence of areas where cancer is frequent or rare; the occurrence of cancer houses; and the various and mutually destructive theories of dietetic causation are all subjects of legitimate controversy in relation to the etiology of cancer in general, but in relation to uterine cancer the discussion would be futile for lack of exact knowledge.

The influence of habits and occupation on the occurrence of uterine cancer is still a matter of speculation. Social position has been supposed to exert an important influence; cancer of the uterus is said to be a disease of poverty and neglect, and to be more frequent among the poorer ranks of all countries. The statement is usually qualified by the remark that it does not hold good for cancer affecting the body of the organ. In my experience in the Midlands the disease has not appeared to be relatively more common among the very poor and those whose lives, in the words of Sinclair,² are "laborious, monotonous, and careworn"; cancers of both cervix and body are by no means uncommon among women in comfortable and even affluent circumstances.

Bashford states that statistically cancer is a function of age, biologically of senescence. Experiments on mouse-cancer have shown that older animals are less suited for inoculation than younger, and that in old age the animal becomes absolutely resistant. In human beings young persons are less likely to be affected by cancer, but when affected the tumour usually shows more rapid growth.

The uterus is most apt to be affected by cancer from the time when the cessation

¹ S. M. Copeman, "Guthrie Lecture," *Practitioner*, August 1907.

² Sinclair, *System of Gynaecology*, Allbutt, Playfair, and Eden (London, Macmillan, 1906).

of its activity approaches until about the age of 75. In extreme old age the disease becomes relatively uncommon. In a table of deaths per million in England and Wales at each of the age periods, the annual deaths from cancer of the uterus increased from 337 per million at ages 35 to 45 to 1012 at ages 65 to 75; and in women of 85 and upwards the rate had fallen again to 730.¹ In the Medical Officer's Report for the City of Birmingham uterine cancer is included under the heading "Cancer of the Genital Organs," of which it forms by far the largest proportion. A calculation of the deaths from genital cancer per million females living in Birmingham at different ages shows on an average of the years 1912 and 1913 an increase from 21 per million at ages 25 to 35, to 2311 per million at ages 65 to 75, after which there is a sharp diminution. While thus the relative incidence of uterine cancer increases until the age of 75 the absolute incidence is greatest at the age group of 45 to 55 and afterwards rapidly diminishes.

The incidence of the disease varies so greatly according as it affects the cervix or body of the uterus that it appears to be impossible to discern common etiological factors. Cervical cancer affects middle-aged married women who have passed through many pregnancies, while cancer of the body occurs in women who are on an average ten years older and are often single and nulliparous, or have passed through few pregnancies. A common factor is that in either case the cancer does not begin in parous women until many years have elapsed since the last pregnancy.

Cancer may grow in any part of the body whose component parts are in a condition of unstable equilibrium, a condition that may be due to a variety of circumstances, such as long-continued irritation, advancing age, traumatism, and heredity. A predisposing condition is in many cases discernible in the form of chronic and persistent alterations of tissue, such as, for instance, occur in the leucoplakia that precedes cancer of the tongue or vulva. In cancer of the uterus it is probable that erosions and eversions play a similar rôle in cancer of the cervix, and that chronic endometritis paves the way for certain cancers of the body of the uterus.

Heredity appears to have a certain, though limited, bearing on the origin of uterine cancer. Roger Williams² found a family history of cancer in 19·7 per cent of his cases; Cullen in 19 per cent; others, who have paid special attention to this point, give rates varying from about 15 to 20 per cent. Murray's observations on the incidence of cancer in mice with cancerous ancestry showed that among those mice whose mother, or one or other grandmother, or all three, had had cancer there

¹ Bashford, *Lancet*, 1909, vol. ii. p. 692.

² W. Roger Williams, *Uterine Tumours* (London, Ballière, Tindall & Cox, 1901), p. 248 *et seq.*

was an incidence of 18·2 per cent, as against 8·6 per cent among mice whose ancestry was free.¹ It seems probable that some persons have a hereditary predisposition to cancer and that this predisposition may not be constitutional but local; that is to say, that some particular tissue or organ inherits the tendency.

Even if it is proved in the future that cancer originates spontaneously and *de novo* there appears to be no difficulty in believing that in some cases, perhaps in many, the disease may be transplanted in some way from an original host. Indeed, with the knowledge now gained from experiments on mouse-cancer, it would be difficult to believe that such an occurrence never takes place.

Many instances have been published of several cases of cancer occurring in the same family. Sir James Paget mentions a family in which three generations were affected; Roger Williams gives a case of uterine cancer in a patient whose maternal grandmother, mother's sister, and two sisters had all died of uterine cancer; he also quotes Athill's case in a woman aged 28 whose mother and two sisters had all died of cancer of the same organ, and Guthmann's instance of cancer of the body of the uterus occurring in three sisters. In all such cases there is a possibility of contagion or of equal exposure to infection.

Cullen² relates an instance of uterine cancer occurring in three sisters; the father's death was due to cancer of the face; one sister died under an anaesthetic when about to be operated upon for uterine cancer; the other two, aged 56 and 52, were operated upon for cancer of the body of the uterus with an interval of less than four months. It would seem at least possible that in this case either a common external cause had given rise to the uterine cancer in the two sisters, or that the tumour had been by some means transplanted from one to the other. The fact that the kind of cancer, adenocarcinoma, and the particular locality, the endometrium, were the same in both the sisters make it still more probable that transference took place from one to the other. It is to be regretted that the date of the third sister's illness and the nature and seat of the cancer are not given.

Implantation is not easy or it would be more common and striking; it is now wonderfully successful in mice under conditions which were undiscovered until a few years ago. Such a transference takes place in the human being in the implantation metastases in stitch-holes and surgical incisions, and in contact-cancers. Inoculation into another individual of the same species varies in difficulty according to conditions of immunity still not understood; in mice, young animals are more suited than older ones.

¹ J. A. Murray, *British Medical Journal*, 1911, vol. i. p. 1177.

² Cullen, *Cancer of the Uterus* (London, Kimpton, 1900), p. 647.

The following case affords striking evidence of the possibility of transference from one person to another :

CASE 1. A tripara aged 31 whose last child was born five years previously, nursed her mother for some months until death from cancer of the cervix on January 8, 1904. The patient succeeded to her mother's effects, and among them to her clothes, which she wore ; and to the towels, bedclothes, and so on, which she continued to use. The catamenia recurred regularly until the middle of June when it began at the usual time, but soon stopped ; four days later a sudden profuse loss with clots occurred, and was followed by continuous watery discharge streaked with blood. On the tip of the anterior lip a small raised warty excrescence formed the end of a growth that had infiltrated the anterior cervical wall half-way to the internal os. The growth was a typical solid alveolar carcinoma with some keratoid degeneration. The cavity of the uterine body was dilated with puriform fluid. The uterus was removed by vaginal hysterectomy on July 25, and the patient remains well now, more than ten years later.

This case has many interesting points in common with experimental cancer, and there were abundant opportunities for transference from mother to daughter. The youth of the patient, the fact that the same part was affected in each case, and the permanent cure by operation, all seem to point to the probability of the daughter having acquired the mother's tumour. Moreover the blood-relationship may help to explain the increased susceptibility that may be supposed to have existed in the daughter. The necessary inference from such cases is that, in some instances at least, cancer is directly acquired from another person ; that probably in these cases there is diminished immunity, often due to blood-relationship ; and that possibly the diminished immunity may be purely local, since in most of the cases the same organ and apparently the same part of the organ is affected. The question of the usual origin of sporadic cancer is left untouched ; an exciting cause, external or internal, possibly exists and may still be discovered ; or the affection may finally prove always to be derived from a previous case.

The Structure and Origin of Uterine Cancers

For many years it has been customary to describe cancer as originating in epithelial structures, with the postulate, expressed or implied, that the epithelium, or certain parts of it, was directly transformed into the new growth ; the epithelium itself became malignant. This conception on closer analysis is found to be twofold ; it implies, in the first place, that cancer owes its origin to some metamorphosis of the epithelium normally found in a part, and in the second, that the continued growth and development of the disease depends entirely, or in part, on a progressive malignant

alteration of the normal epithelium. Recent investigations have shown that the second part of this conception is erroneous, while the first part is at least open to grave doubt. That cancer takes its origin in intimate relations in space with pre-existing epithelium is certain, but that its inception is due to *metaplasia of the normal epithelium* has not been proved.

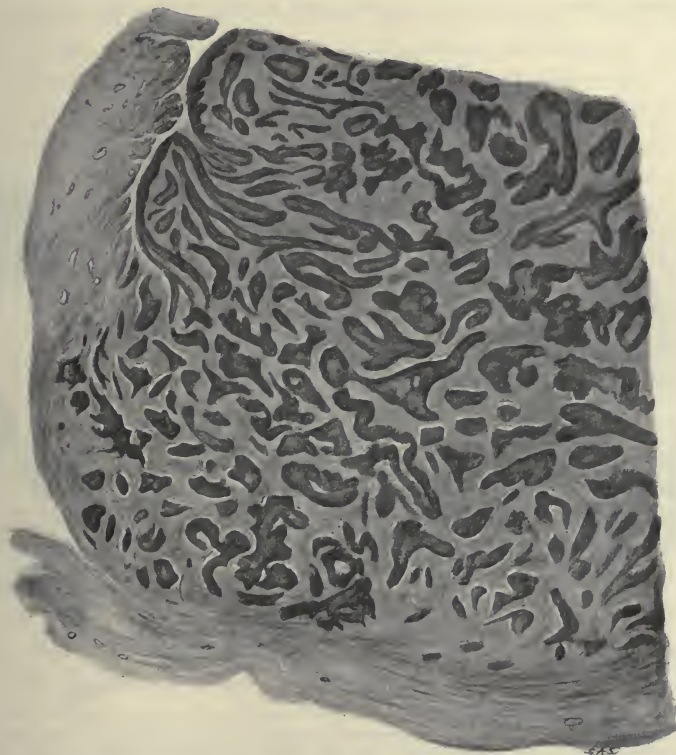


FIG. 217.—Solid alveolar carcinoma of the cervix with typical stratified squamous evolution, showing the arrangement and the varying shape and size of the alveoli on cross section. Above and to the left is normal cervical mucous membrane, and between this and the surface of the tumour is a section of one side of the cervical canal. ($\times 10$.)

In the uterus the surface is covered by three distinct varieties of epithelium. The vaginal surface of the cervix is provided with a stratified squamous epithelium which covers a corium with a few low papillae, but without glands. The mucous membrane lining the cervical canal is fibrous, is covered by a single layer of mucus-secreting columnar epithelium and contains numerous branching glands lined by

similar epithelium. The endometrium lining the body is soft, cellular, and non-fibrous, covered by a single layer of columnar ciliated epithelial cells, and provided with numerous vertical tubular glands also lined by a single layer of cylindrical cells. The endometrium is thin and dormant until puberty; thence till the menopause it undergoes, at regular monthly intervals, a very remarkable series of functional and structural changes; after the menopause it undergoes a more or less rapid



FIG. 218.—Diagram to show the mode of development of carcinoma by branching from one original collection of epithelial cells into surrounding connective tissue; sections of such a structure give the appearance of collections of cells lying in spaces in a stroma; the shape of the alveoli varies with the angle at which the collections of cells are cut.

atrophy, the whole structure becoming thinned and fibrous, the epithelial lining cells lower, and the glands diminishing in number and size.

In addition to the differences just enumerated, the surface-covering of the uterus is complicated at the isthmus, or internal os, by a longer or shorter stretch of transitional epithelium. At the external os the conditions are much more varied; normally there is in this situation a small extent of transitional epithelium; as the result of

labour lacerations occur, usually lateral, varying greatly in extent, and often giving rise to more or less eversion of the cervical lining. Further, as the result usually of infection by germs, the condition known as erosion is extremely common.

The classification of cancer of the uterus that has become customary was introduced by Ruge and Veit, and adopted by John Williams.¹ Cancers of the body of the organ are distinguished from those affecting the cervix, and the latter are divided into cancers of the vaginal portion and those beginning in the glands or surface-epithelium of the cervical canal. The distinction between these two classes of cervical cancer is based largely on supposed similarities between the structure of the tumours and the epithelium in which they are believed to originate. Careful examination of large numbers of cases has shown, however, that there is no characteristic difference in structure between tumours arising in these situations, but that on the contrary there is a certain range and variety of structure common to most cervical cancers. It will be convenient at the outset to consider the morphology of uterine cancers in general, and the varying points of origin, and therefrom to deduce a classification that will answer for the purposes of study.

Histological Characters and Varieties

On transverse section a cancerous tumour appears to be made up of cords, or tubes of cells, of epithelial character contained in spaces or alveoli that vary in size and shape, and are formed in a stroma of connective tissue (Fig. 217). The alveoli appear to be distinct from each other, but in serial sections are found everywhere to communicate, so that their varying oval or rounded shape is seen to be chiefly due to the angle at which the section has crossed them. The whole tumour grows from a small solid or tubular collection of cells that extends in all directions and sends out branches which divide and subdivide like the roots of a tree; these push continuously into the surrounding structures whose connective tissue becomes modified to form the stroma that nourishes and supports the epithelial elements. The primary tumour in carcinoma thus forms a structure roughly resembling the roots of a plant (Fig. 218).

Investigation shows that cancer of the uterus, as elsewhere, has not a fixed and unvarying structure, but that while all uterine cancers have certain points in common, every individual tumour has its own particular character and arrangement. The same tumour shows varying appearances in different parts and often a gradual differentiation, a certain gradation of structure, can be made out.

The cancerous epithelium in different tumours and in different parts of the same

¹ John Williams, *On Cancer of the Uterus*, London, 1888.

tumour varies greatly in quantity relative to the stroma, in appearance and staining properties, and in arrangement. A broad distinction can be drawn between solid alveolar cancers in which all the alveoli are filled with cells, and glandular cancers in which the alveoli more or less resemble glandular acini lined by one or many layers of cells. A certain number of the latter class of cancers contain a proportion, often considerable, of solidly filled alveoli, but examination of different portions of the tumour, especially at the growing surfaces, enables the distinction easily to be made.



FIG. 219.—The tumour gives the impression that it may have been formed by complicated foldings of the surface-epithelium of the vaginal portion of the cervix. The epithelium is a well-developed and typical stratified squamous one, and shows numerous down-growing processes; the interior of the alveoli contains typical cast-off squames. ($\times 29$.)

When it originates in the cervix, uterine cancer is, in the great majority of cases, solid alveolar in structure; in a small minority the tumour is glandular. Carcinoma beginning in the body of the organ practically always belongs to the glandular variety; in rare and doubtful cases only has solid alveolar cancer been described as beginning in this situation.

Solid Alveolar Carcinoma.—Cancers of the cervix have been divided into *squamous epithelioma*, originating in the epithelium covering the vaginal portion of the cervix, and *spheroidal-celled carcinoma*, originating in the surface- or glandular-epithelium of the cervical canal. In some cervical tumours the epithelial con-

stituents recall more or less vividly the stratified covering of the vaginal surface of the cervix (Fig. 219); in each alveolus the basal cells next to the stroma are more or less cylindrical in shape, the succeeding cells are irregularly rounded, and those in the centre become flattened and swollen, losing their nuclei and resembling roughly the surface-layers of a stratified squamous epithelium. Frequently the central horny cells are arranged in a spherical bunch, the so-called 'epithelial pearl.' In a certain number of cases the cells in the outer younger layers show prickles.

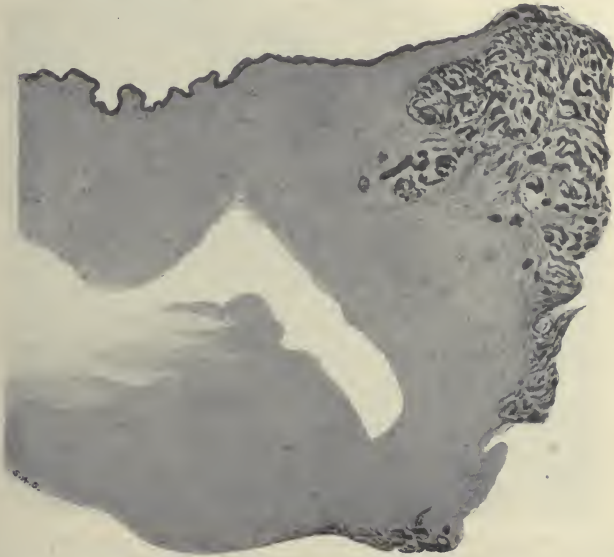


FIG. 220.—The stratified surface-epithelium becomes gradually thinned and ceases as it approaches the surface of the cancerous tumour. ($\times 6$.)

Uterine tumours showing the characteristics just mentioned have been called squamous epithelioma and have been supposed to take origin in the epithelium covering the vaginal portion of the cervix. The transformation of the normal squamous epithelium into a malignant tumour has been described as being usual and frequently recognizable at the growing edge of the tumour. As the normal epithelium approaches the growing edge it is said to send out processes into the subjacent corium which concurrently shows an increased number of elongated vascular papillae projecting upwards into the epithelium. The basement-membrane disappears, the demarcation between epithelium and connective tissue becomes broken, the ends of the down-growing processes of the epithelium branch and break

up, and the epithelial cords begin to proliferate abundantly into the subjacent tissues. With this description imagination has had much to do. I have examined the growing edges of a large number of uterine cancers and have not yet seen appearances which render necessary the above explanation. The normal epithelium is quite distinct in character and appearance from the malignant epithelium, and the two are in most cases separated by a distinct zone. In many instances the two

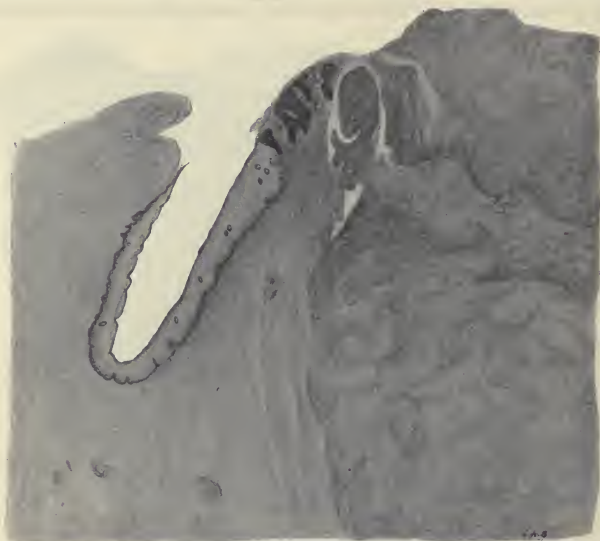


FIG. 221.—Edge of solid carcinoma. The squamous surface-covering, on approaching the margin of the growth, becomes markedly thickened; the surface-cells are greatly swollen. The deepest layers stain well and preserve their relations to the subjacent tissue. At the thicker end, the surface-epithelium is immediately in contact with alveolar collections of tumour-cells, which stain well. The appearances are compatible with the derivation of tumour-cells from the deeper layers of surface-epithelium. ($\times 12$.)

kinds of epithelium are more or less mingled together, but show quite distinctly their essential differences.

The squamous epithelium covering the vaginal portion of the cervix or the vagina, as it approaches the tumour, frequently shows marked changes; these are of the nature of degeneration or irritation, and vary much in different cases. Sometimes the epithelium gradually becomes thinned and ceases altogether before the tumour is reached (Fig. 220). In other cases the surface-covering becomes thickened and the more superficial layers of cells swollen, while the deeper layers preserve their normal appearance and staining properties; the thickened end then ceases

abruptly in contact with the tumour cells (Fig. 221) or the thickened portion may stain diffusely and cease at a little distance from the growth as in Fig. 222 where the epithelium stops as it approaches the margin of an inflamed malignant ulcer. Sometimes the thickening is due to increase in the number of deep layers of darkly staining epithelial cells. Very commonly, as the edge of the growth is approached, the deeper layers of the epithelium send numbers of down-growing processes into the subjacent

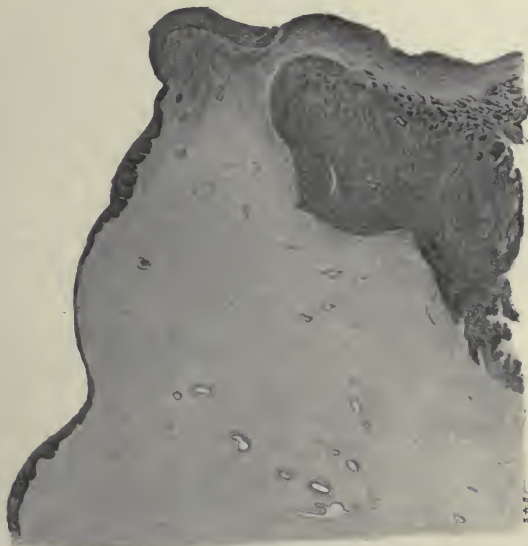


FIG. 222.—The surface-epithelium shows marked variations in thickness, varying with signs of subjacent inflammation; as it approaches the tumour first shows numerous downgrowths; then, along with very marked small-celled infiltration of the connective tissue, it becomes somewhat thickened and stains diffusely; it ceases abruptly where it meets the much inflamed and ulcerating surface of the cancer. ($\times 12$.)

corium (Fig. 223, cf. also Fig. 222). These processes are probably due to irritation, and similar appearances are seen in various non-malignant conditions; in the border, for instance, of a so-called pressure sore from a neglected prolapse (Fig. 224), and in a tuberculous cervix (Fig. 225).

Occasionally, the squamous covering is continuous with, and may appear on superficial examination to give origin to, the carcinoma, as in Fig. 226, but even here careful examination, under a higher power, shows that the division between normal and malignant epithelium is abrupt. In its extension the new growth may penetrate between the normal glands of the mucous membrane (Fig. 227 and 228), which are

then found scattered through the tumour, but which are easily distinguishable on section from the malignant alveoli.

The epithelial contents of the alveoli vary much in character. The carcinoma-cells are usually larger than the cells of the normal epithelium; but they may be

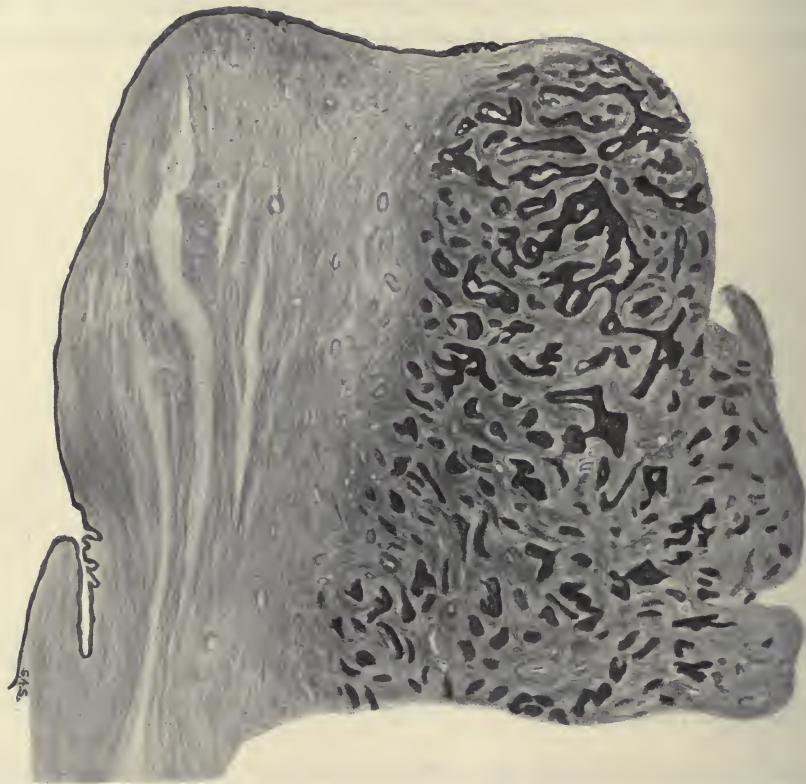


FIG. 223.—On approaching the cancer the surface-epithelium becomes thickened, especially in the deeper, more darkly-staining layers; it then rapidly thins off and disappears some distance from the surface of the tumour. ($\times 8$.)

merely of the same size or even smaller than the latter. In some tumours the whole of the cells appear to be soft and little prone to degeneration; the cells are irregular in size and shape, polyhedral by compression, and vary little in appearance from the periphery to the centre of the alveolus (Fig. 229). In other tumours the alveoli are lined by a well-developed, stratified, squamous epithelium, the cells

next the stroma being cubical or columnar in shape, the next layers oval or polyhedral,

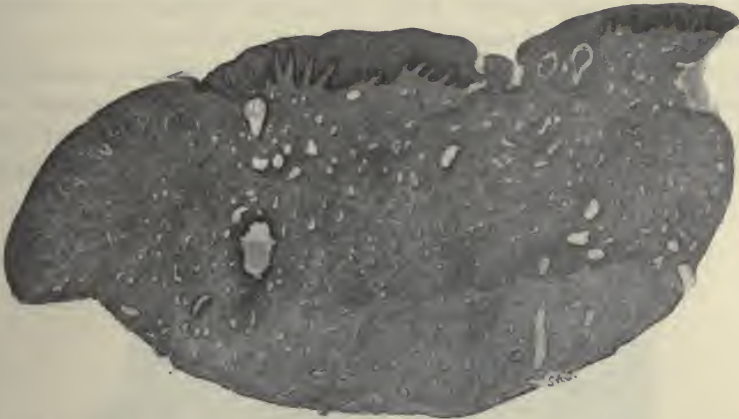


FIG. 224.—Margin of so-called pressure-sore from old prolapse, showing irregular thickening of squamous epithelium and numerous down-growths. ($\times 10$.)

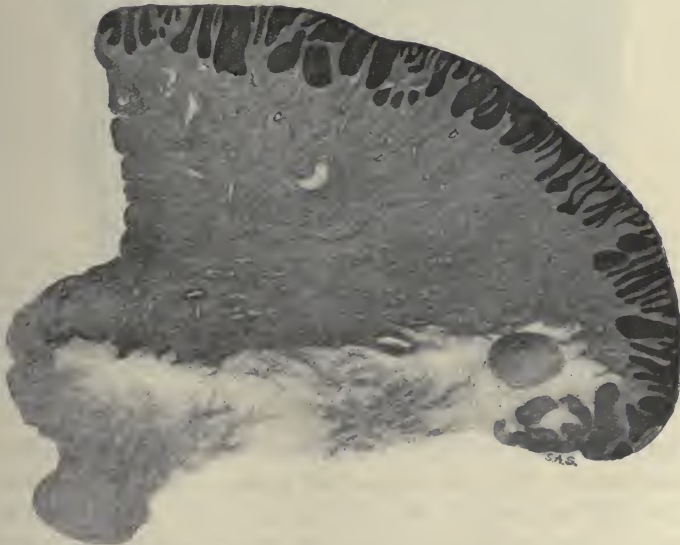


FIG. 225.—Section of tuberculous cervix, showing irritation of squamous epithelium as evidenced by numerous down-growths. The tuberculous disease formed an ulcer, which did not extend very deeply, and which showed numerous giant-cell systems. ($\times 12$.)

and those towards the interior flattened and without nuclei ; in the interior, especially

in the largest alveoli, are spaces filled with cast-off epithelial cells (Fig. 230), or occupied by 'epithelial pearls.' Between these two extremes the solid cancers present every gradation of structure.

In many of the alveoli signs of greater or less degeneration or necrosis of the epithelial cells are found. These are most common in the older, more central portions of the tumour and are due mainly to deficient blood-supply. Droplets of a mucoid substance may appear within the cells, and by coalescence may cause the disappear-

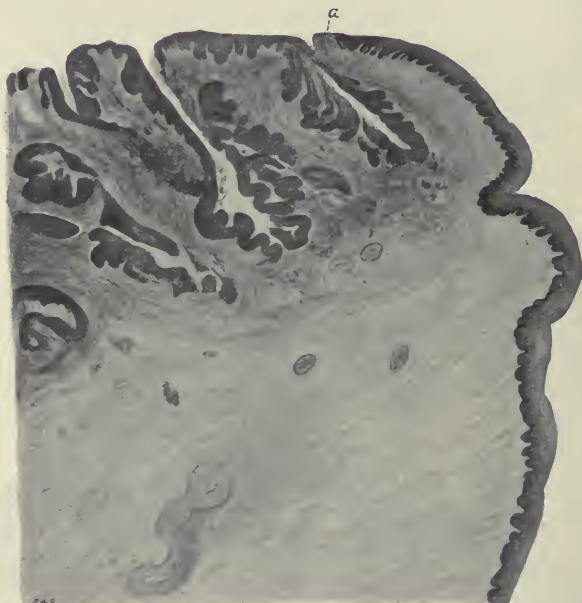


FIG. 226.—The surface-epithelium on the right of the drawing shows numerous down-growths; under a low power it appears to be continuous with the epithelial portion of the cancer, but higher magnification shows clearly an abrupt dividing line between the two structures at *a*, just short of the first cleft. ($\times 12$.)

ance of both protoplasm and nucleus (Fig. 231). The stroma undergoes a similar change more slowly. The most common and striking degeneration is that which is known as hyaline or keratoid. The cells become swollen and glassy-looking; the nucleus becomes irregular and breaks up, and finally a group of cells may fuse and give rise to a homogeneous hyaline mass (Fig. 232). Often the resulting appearance is entirely similar to that of the 'cell-nests' or 'epithelial pearls' found in typical squamous epithelioma. The keratoid change is the result partly of lack of nourish-

ment probably leading to a mucoid degeneration, and partly of loss of moisture. It is found in varying degree, sometimes slight, often extensive, in the majority of cases of solid cancers of the cervix, whether originating on the vaginal surface or in the canal; it is commonly found also, as will be seen presently, in the older portions of glandular cancers of the body of the uterus.

No hard-and-fast line can be drawn between the tumours with, or without, keratoid degeneration either as regards structure or place of origin. The examination

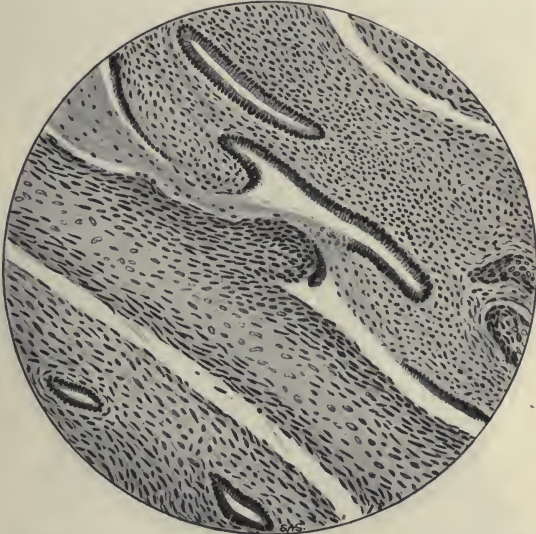


FIG. 227.—Section near the growing margin of a highly differentiated squamous epithelioma. Scattered among the cancerous alveoli are many glands lined by a single layer of secreting columnar epithelium. In many places, as in the middle of the figure, these glands are invaded by the new growth, the glandular epithelium being first raised at the invaded portion, and then disappearing; the wall of the gland thus becomes in part formed by the surface of the malignant epithelial cord. ($\times 209$.)

of the growing edges gives no indication of the evolution of the tumours from the natural epithelial covering but, on the contrary, supports the view that the cancer grows by multiplication of its own elements. Animal experiments confirm these observations. It, therefore, appears better to drop the term squamous epithelioma, which implies development from the epithelium covering a definite part of the cervix, and to speak of solid alveolar carcinoma of the cervix, possibly with a qualifying adjective according to the kind and amount of degeneration shown. As keratoid degeneration appears to be the most common and striking form, solid alveolar carcinoma may be characterized as showing much, little, or no keratoid degeneration.

This is the classification adopted by Schottlaender, and appears best to cover the facts. A careful comparison between the amount of keratoid change present in the cancer and the clinical features of the case failed to show any relation between the degeneration and the degree of malignancy.

Glandular Carcinoma.—The other large class of uterine tumours appear as if they may have taken origin in an eccentric proliferation of the glands of cervix or body. If the epithelial lining of such a gland began to proliferate without limit it

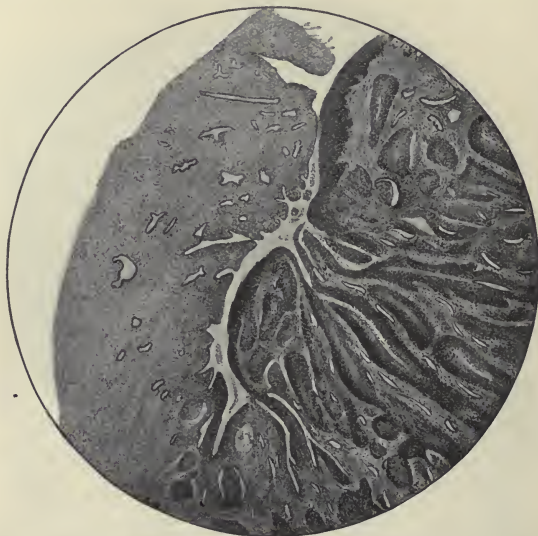


FIG. 228.—Portion of section in Figure 217 under higher magnification. The cervical canal is bounded on one side by normal mucous membrane, on the other by the surface of the new growth; this has penetrated towards the surface from the deeper layers of tissue, and has engulfed many normal cervical glands, which are seen on section between the cancerous alveoli. ($\times 29$.)

would either form buds projecting inwards towards the lumen, the whole alveolus at the same time enlarging; or it would cause finger-like processes to push out into the surrounding stroma forming new acini, the lumina of the proliferating tubes remaining unaltered in size. In the former case a tumour would be formed with large alveoli into which numerous papillae projected (Fig. 233); in the latter a glandular structure with small alveoli would result (Fig. 234).

Various terms are employed, often loosely, to designate different varieties of glandular cancer. These may conveniently be employed to describe certain different kinds of structure met with in cancerous tumours, but in using them it is well to



FIG. 229.—Section of cervical cancer under moderate magnifying power, showing sections of epithelial cords of varying size, cut at different angles, lying in a stroma of cellular connective tissue.

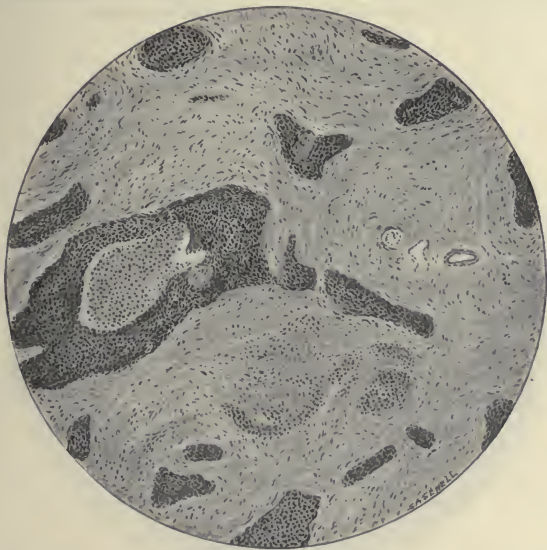


FIG. 230.—The large alveolus is lined by an epithelium of which the basal cells are mostly higher, more cubical, and the succeeding layers more and more flattened as the central cavity is approached; areas of keratoid degeneration are present, and there is a large central cavity filled with degenerated and cast-off epithelial cells. ($\times 132$.)

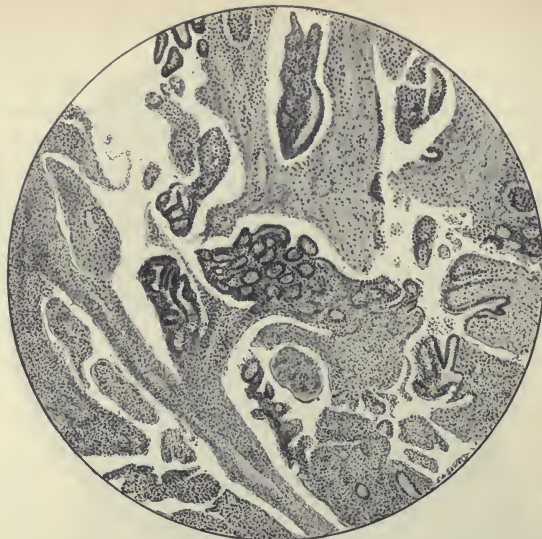


FIG. 231.—Adenocarcinoma infiltrating the uterine cornu. The alveoli are fairly large, and filled with cells that have shrunk in the hardening fluid. In the midst of the epithelial cells are many small circles of cells surrounding lumina. These probably represent sections of much convoluted gland-like acini. Another possible interpretation has been suggested—that these are pseudo-acini, formed by mucous degeneration in the midst of solid collections of cells filling the alveoli. ($\times 80$.)

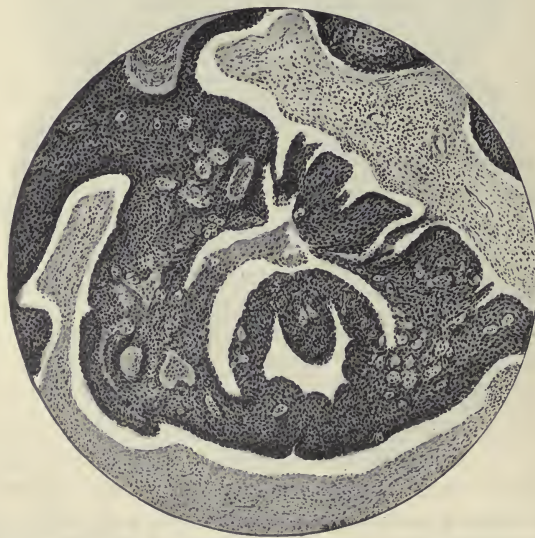


FIG. 232.—A large alveolus from a solid cancer with much keratoid degeneration. The layers of cells adjoining the stroma are fresh and stain well; at a little distance there is marked horny degeneration, and in the interior are many cavities of varying size and shape, filled with cast-off epithelial cells and their *débris*.

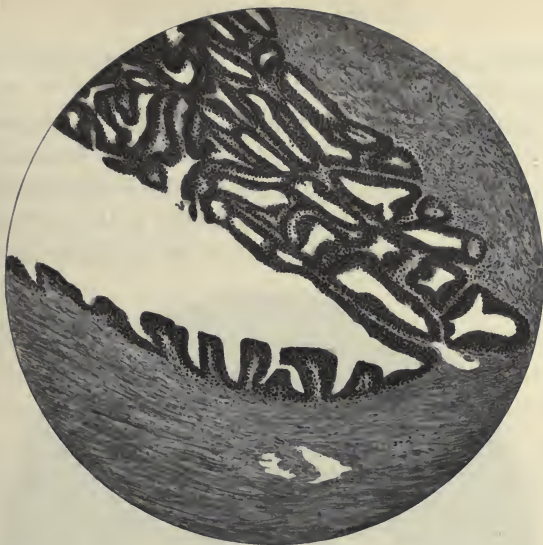


FIG. 233.—Adenocarcinoma of inverting type from body of uterus.
Large alveolus with papillary processes covered with two or three layers of epithelial cells.

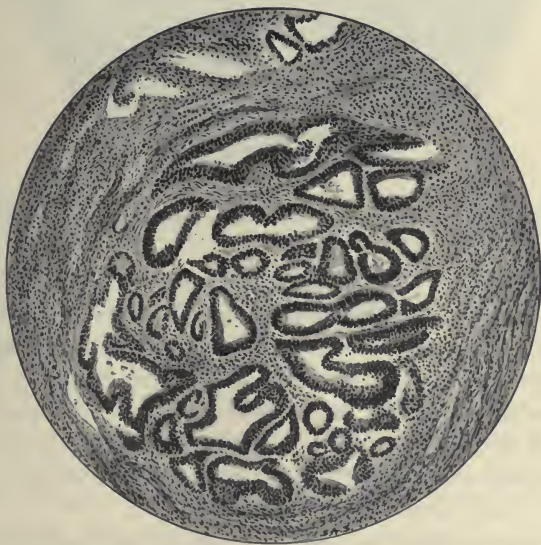


FIG. 234.—Lobule of adenocarcinoma, everted form.
Small acini, lined mostly by one or two layers of epithelial cells.

remember that they are only descriptive and by no means connote essential differences in nature or malignancy.

The term *malignant adenoma* or *columnar epithelioma* is applied to cancerous tumours in which the alveoli are lined by a single layer of columnar epithelial cells (Fig. 235). Sometimes it is difficult to decide whether a given adenomatous tumour is simple or malignant. In malignant tumours the epithelium lining the acini is generally less regular, the nuclei being placed at varying heights in the neighbouring

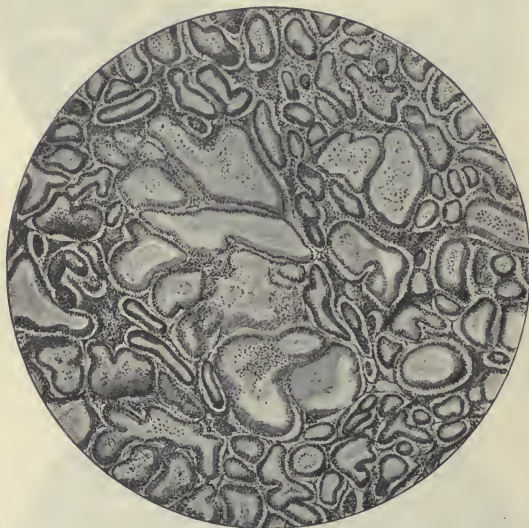


FIG. 235.—Curetting from a case of cancer of the uterine body. Malignant adenoma of everted type, showing small alveoli closely packed with very small amount of stroma; the lining consists of one layer of high cylindrical epithelium.

cells. A more important point in the differentiation is found in the number and arrangement of the acini; in simple adenoma the glands are generally separated from each other by a greater distance than their diameter; in malignant adenoma the glands are crowded together with little or no intervening tissue; the epithelial cells thus appear to be arranged back to back instead of, as normally, facing each other. In serial sections the individual glands, in simple cases, can be traced and are found to branch comparatively little; in malignant tumours they seem to be commingled and much subdivided.

The term *adenocarcinoma* has been used with at least two different meanings: to denote either a cancer in which the acini, no matter with what contents, appear

to have a glandular arrangement, or one in which the acini still contain a lumen, although they are lined by two or more layers of epithelial cells. It would appear to be convenient to limit the use of the term to the latter meaning. With Ruge, two varieties of adenocarcinoma may be distinguished for descriptive purposes. In one, the *inverting variety*, the acini are large, with papillae projecting inwards towards the lumen (Fig. 233). In the other, the *everting variety*, the acini remain small, and more closely resemble tubular glands (Fig. 236). Both forms of growth commonly

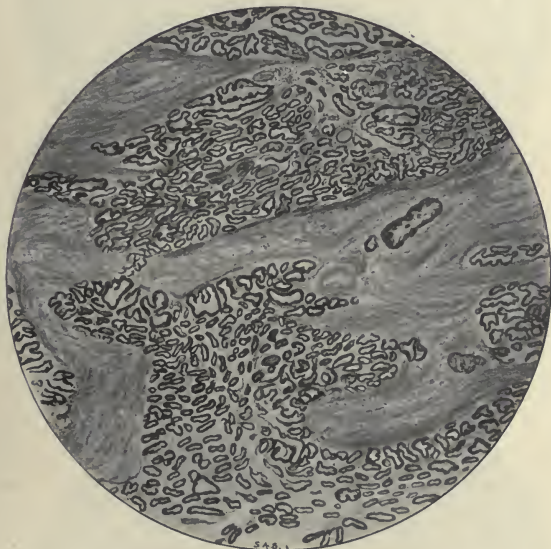


FIG. 236.—Section of adenocarcinoma, everting form, of the body of the uterus. Low power.

occur together in the same tumour. In more advanced forms of glandular carcinoma the alveoli become completely packed with epithelial cells, and the glandular origin of the tumour may become obscured.

The process of filling an alveolus varies in different cases. In the *inverting* type of growth buds grow inwards from the epithelium lining the cavity, unite by their apices, and by continual increase in size gradually occupy the whole space; one or a number of small lumina are often seen in such an alveolus before it has become completely filled. Less commonly a centrifugal growth of cells takes place, and this is especially seen in the *everting* type of tumour (Fig. 237); the original lumen with its epithelial lining sometimes remains preserved for a long time;

multiplication of the epithelium gives rise to layers, or collections of cells, that are added to the outside of the original epithelium and grow outwards into the stroma. In this way the alveoli in the evverting type of growth may attain to considerable size. In the older parts of the tumour mucoid and hyaline or keratoid degenerations of the epithelium are very common (Fig. 237). In many cases the latter form of degeneration is widespread, and it often gives rise to appearances strikingly similar to the 'cell nests' found in squamous epithelioma (Fig. 238).

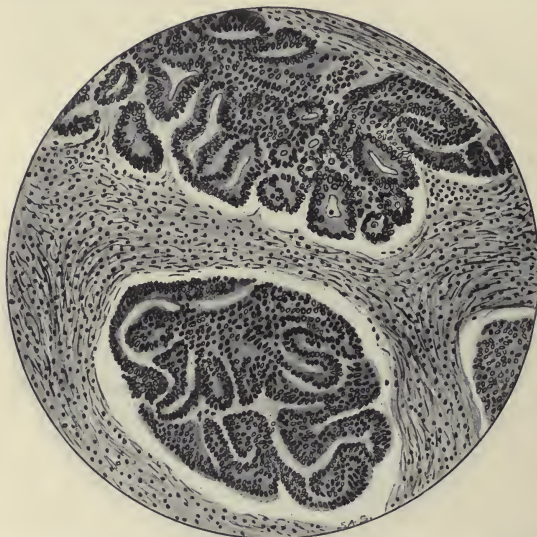


FIG. 237.—Alveoli of adenocarcinoma of body of uterus. The spaces are filled with cells which are apparently, in part, the lining-cells of tortuous and complicated gland-tubes, and in part masses formed by proliferation outwards from the tubes. In places the appearance suggests that imitation-acini are formed by the mucoid degeneration of a group of cells in the middle of a solid mass. ($\times 209$.)

In glandular cancers of the uterus it is rare to find the same structure throughout. Malignant adenoma, adenocarcinoma, and spheroidal carcinoma appear to represent different stages of differentiation. It must be clearly understood that they are equal in malignancy, malignant adenoma being as inevitably fatal as spheroidal-celled carcinoma. It is common to find two or more of the varieties of structure at different parts of the same growth, and, speaking generally, it appears that the spheroidal-celled carcinoma is found in the oldest portions, and the other varieties in the younger and more recently formed portions of the growth. This differentiation, from the simpler arrangement to the more complex, accounts no doubt for

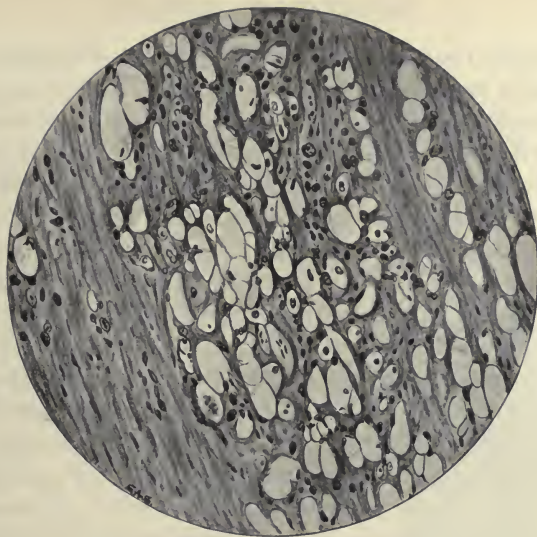


FIG. 238.—Section from an inverting adenocarcinoma of the body of the uterus that had penetrated nearly to the peritoneum, showing marked mucoid degeneration of epithelial cells. ($\times 278$.)

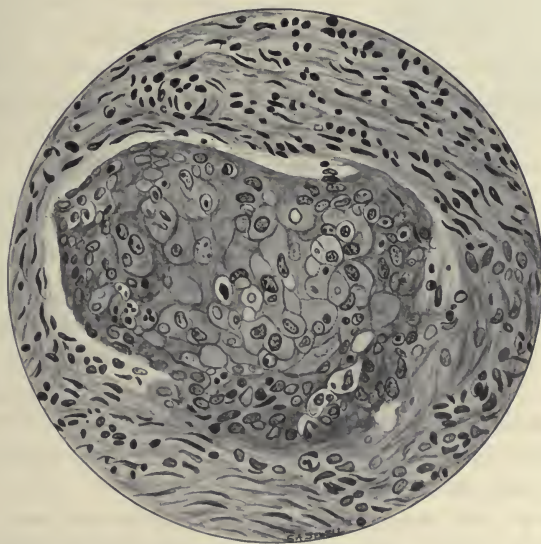


FIG. 239.—Alveolus filled with cells that have undergone keratoid degeneration; from the central portion of an inverting adenocarcinoma of the body of the uterus.

statements that have sometimes been made that in successive curettings the gradual formation of cancer has been watched. The suggestion has been made that a simple glandular endometritis has been seen to develop into a malignant adenoma, and thus in time to go through the stages above described; the latter series of changes has very likely been seen, but the presumption of the transformation of a simple into a malignant growth has probably been based on error.

The Stroma.—The connective-tissue and vascular framework of the cancer is derived from the fibro-muscular wall of the uterus, which responds to the chemio-tactic stimulus of the cancerous epithelium by a 'specific stroma reaction.' The stroma varies very much in amount, as well as in vascularity, and in the number of contained cells. Gierke¹ distinguishes a fibroplastic and an angioplastic stroma-reaction, according to the degree in which the connective tissue and the blood-vessels participate. If the two kinds of reaction are in equilibrium a sound well-nourished cancer results. Excess in the fibroplastic reaction leads to interference with the nutrition of the tumour and its epithelial constituents; and if the angioplastic reaction preponderates oedema and rupture of vessels commonly result from slight causes.

Many varieties of accident and degeneration are thus common in the stroma, especially haemorrhage, oedema, and colloid degeneration. In oedema, considerably enlarged spaces are seen between the fibres which are themselves frequently swollen. In colloid degeneration the fibres become much swollen and are separated from each other by transparent homogeneous material; the nuclei become irregular and less darkly stained, and finally broken up. Occasionally the stroma appears to undergo a transformation into true myxomatous tissue.

Fatty degeneration appears to occur not unfrequently in tracts of the tumour. Coagulation necrosis is not uncommon, especially in the older parts of the growth, parts or even the whole tumour becoming opaque and cheesy-looking. As a result of septic infection, clusters of leucocytes are often seen especially around the vessels.

At the growing edge blood-vessels are numerous, and the circulation active; in the older portions the vessels are frequently found filled with blood-clot. A narrow zone of tissue neighbouring on the growing margin frequently shows peculiarities in staining reaction, sometimes not taking up the dye, and sometimes being coloured diffusely. Such changes may be due to the local action of toxins or aggressins preparing the ground for the spread of the cancer.

Point of Origin.—A broad division can be made between cancers beginning in the cervix and those beginning in the body of the uterus, though occasionally difficulty

¹ Gierke, *Imperial Cancer Research*, Third Scientific Report, p. 128.

may arise in classifying an individual specimen. Attempts have been made with less success to classify the tumours of the cervix into cancers of the vaginal portion and cancers beginning in the cervical canal. These attempts depend on the recognition of the starting-point of the tumour in early cases, and in later ones on the distribution of the tumour and the consideration of its modes of spread.

In the immense majority of cases the growth is already far advanced when first discovered. Of 136 specimens of cervical cancer removed by radical operation only 10 could be described as early. The tumours were classified histologically into solid alveolar cancers, 126; glandular cancers, 10.

Six of the solid cancers were early, one of them forming a very small discoloured ulcer on the free end of a mucous polypus that projected from the external os. In two cases there were small ulcers, one in the lower, and the other in the upper part of the cervical canal. The other three tumours formed papillary outgrowths; two grew from the margin of the external os, one in front and one behind; the third grew outwards from the whole circumference of the margin.

Four of the ten glandular cancers of the cervix were early, and of them one formed a small lobulated polypoid growth from the anterior lip of the cervix; a second formed a small pedunculated cauliflower growth attached to the vaginal cervix half an inch away from the external os; a third formed an ulcer one inch in diameter on the left side of the

cervical canal in its lower part; and the fourth was a small rounded nodular thickening in the posterior lip, with a broad connection with the surface.

These ten early cases show that cervical cancer may begin at any part of the surface, and it is suggestive that three of the solid tumours and two of the adenocarcinomata originated in the neighbourhood of the external os. Sinclair, and more recently Bonney, have stated that the os is implicated in every case of cervical cancer, and this is practically true for the more advanced cases. But in the early cases that can be used for more exact observation half the number only begin at the



FIG. 240.—Cancer beginning at the isthmus.

A glandular ulcer affects the greater part of the cervical canal in the senile uterus of a lady of seventy. The external os is unaffected. The deepest part of the ulcer is in the upper part of the canal, apparently just below the isthmus. The growth extends higher upwards in the muscular wall than along the mucous membrane. It is classified as cervical cancer.

external os. This is a large proportion, and is probably in close causal relation with the frequency of eversions and erosions in this situation.

Another common starting-place for uterine cancer is at or near the isthmus. One of the early, solid alveolar, cervical cancers above mentioned began in the posterior wall of the upper part of the cervical canal. In Fig. 240 there has been considerable excavation of the upper part of the cervix by a cancer which it is reasonable to believe began at or a little below the internal os. In Fig. 241 an extensive nodular growth is present of which the largest part is in the region of the isthmus.



FIG. 241.—A nodular cancer affects the whole length of the cervical wall. The greatest thickness is at the isthmus, where the tumour possibly originated.

In several of my cases classified as localized cancer of the body, the disease appeared to have arisen in the same region. The distinction between cancer of the body and of the cervix may thus sometimes be doubtful, even in comparatively early cases. A similar difficulty was experienced by Schottlaender and Kermauner:¹ in 134 cases of uterine cancer 117 began in the cervix, partly at the external os; 8 certainly, and 3 more probably, began in the endometrium; while 6 were classified as isthmus cancer, since it was impossible to say whether they originated in cervix or body.

Nodular cancer as a primary tumour, contained in and limited to the thickness of the muscular wall of the cervix, is not very common and is always in close relation with the mucous membrane at some part of its surface. It is fair to conclude that in such cases the disease begins in the mucous membrane, probably in the deeper layers, and that the most favourable soil for its development is found in the muscular coat. This was apparently the case in my tenth case above referred to, in which a cervical adenocarcinoma formed a rounded nodule in the posterior lip of the cervix.

In more advanced specimens—and these form the great majority—an attempt may be made to infer the probable place of origin by studying the extension of the growth. A cancer affecting the cervical mucous membrane which spreads into the body by infiltrating only the muscular wall may confidently be reckoned as primary cervical. Where the disease spreads along the mucous membrane above and below the internal os it may have begun either in body or cervix, or actually in

¹ Schottlaender und Kermauner, *Zur Kenntnis des Uteruskarzinoms* (S. Karger, Berlin, 1912), p. 642.

the isthmus between the two. The histological structure may be called to witness, but is fallacious in that adenocarcinoma, the typical body cancer, is also found in



FIG. 242.—Cancer of the cervix. Extended abdominal hysterectomy. The external os is somewhat large and irregularly eroded; the cervix is greatly elongated and expanded by a firm, greyish-white, and opaque growth which extends as high as the isthmus, and internally shows an irregular ulcerated cavity in the position of the cervical canal. Transverse section shows that the tumour is covered all round by a thin layer of muscular coat, and that the greatest extent of growth is in the right anterior wall. The right ovary is expanded into a cyst, over the surface of which courses the outer half of the Fallopian tube.

cervical cases, and that cancers of the body may have a solid alveolar structure throughout.

The part where the largest collection of growth is situated may merely point to the position where the tumour found conditions most favourable to its growth, but as a rule the greatest expansion is the best guide to the starting-point of a uterine cancer. The extension has to be studied in three dimensions, and this may

conveniently be done in three stages (Fig. 242). The relations of the lower part of the tumour, especially to the cervix and external os, are first noted ; next the distribution of the new growth is studied on a vertical antero-posterior section of the uterus and vagina ; and finally a horizontal transverse section across the largest part of the growth, usually somewhat above the attachment of the vagina, shows the relations of the growth to the canal and walls of the cervix, and to the surrounding connective tissue. By studying the distribution in this way Schottlaender found that in cervical cancer the growth was confined to the anterior or posterior wall in a very small proportion, 6·7 per cent, of operated cases. In more than four-fifths the growth was placed asymmetrically in the wall of the cervix, and in only about one-third was part of the circumference left free.

Classification of Uterine Cancer

In the great majority of cases the point of origin of the tumour can be roughly inferred and a distinction made between cancers of the body and cervix. This division is useful inasmuch as the two classes show marked differences in incidence, symptoms, and course. It is nevertheless important to bear in mind that in a certain number of cases, even in the early stages, it may be difficult or impossible to define the exact starting-point of the disease.

The histology of the tumours similarly fails to establish a hard-and-fast classification. The great majority of cervical cancers are solid alveolar, but a minority are glandular, resembling the typical body carcinoma. In the body a typical glandular cancer is the rule, but solid alveolar tumours have been described, and occasionally the glandular origin is only evident after careful investigation.

The classification of cervical cancer presents much greater difficulty. Both solid and glandular forms are found originating either on the surface of the vaginal portion or in the cervical canal. In the great majority of the tumours the distinction between squamous epithelioma and spheroidal-celled carcinoma cannot be made with certainty. A large proportion begin at or near the external os, often in eversion or erosions ; some begin in the neighbourhood of the isthmus. The largest number are already so far advanced when first seen that the exact point of origin is doubtful. Further, as no distinct clinical differences have been found to accompany variations in form, structure, or location of cervical cancer, it does not appear desirable to retain a classification based on so many fallacies. A division will therefore be made into cervical and corporeal cancer, and of the cervical cases the glandular tumours will receive separate consideration.

An analysis of all cases of cancer of the uterus met with in my hospital and private practice from 1896 to the end of 1913 has been made for the purpose of this article. The hospital cases include all that attended in the out-patient department, many of which were seen by the assistants in that department, Messrs. Hewetson and Beekwith Whitehouse, who also performed some of the operations, and assisted in most of mine. The total number of 596 cases included 67 in which the body of the uterus appeared to be the primary seat of the disease, and 529 cervical cancers. The latter will first be dealt with, adenocarcinoma of the cervix being considered separately; and afterwards cancer of the body will be described.

PART III

CANCER OF THE CERVIX

Incidence.—Cancer of the cervix is occasionally seen in extremes of age; thus Joseph Adams¹ relates a case in a child of $2\frac{1}{2}$ years; Cragin² and de Rouville³ have each seen cases in girls of 18, while Findlay⁴ recorded a case in a woman of 93, who had borne eight children, one of whom died at the age of 48 of uterine cancer.

The great majority, 87 per cent, of cervical cancers occur between the ages of 35 and 65, as is shown in the following table of 347 cases from my own practice:

CARCINOMA OF CERVIX, 1904-1913

	Operated.	Inoperable.	Total.	In 100 Cases of Cancer of the Cervix.
20 to 25	1	0	1	0·2
25 to 35	8	14	22	6·3
35 to 45	30	71	101	29·0
45 to 55	31	102	133	38·3
55 to 65	21	45	66	19·0
65 to 75	4	19	23	6·6
75 to 85	1	0	1	0·2
	96	251	347	

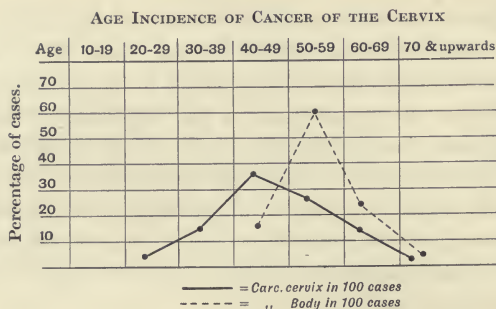
¹ Joseph Adams, *Royal Society of Medicine (Section of Obstetrics and Gynaecology)*, May 7, 1914.

² Cragin, *American Journal of Obstetrics*, January 1913.

³ De Rouville, *Bulletin de la Société d'Obstétrique et de Gynécologie de Paris*, April 1912.

⁴ Findlay, *American Journal of Obstetrics*, October 1902.

CANCER OF THE UTERUS



In proportion to the number of women living at different ages, cervical cancer increases steadily from the age of 35 to 75, and afterwards markedly diminishes, becoming very rare in extreme old age.

Among the 347 cases above tabulated 308 of the patients were married, and 31 widowed, while only 8 were single. The number of pregnancies was noted in 337 cases; 23 patients were nulliparous, 98 had had from 6 to 9 pregnancies, and no less than 83, or nearly a quarter of the whole number, had had 10 pregnancies and upwards. The average number of pregnancies in the 337 cases showed 5.58 labours at term, and 0.87 abortions, an average of nearly $6\frac{1}{2}$ pregnancies to each patient. It follows that the etiology of cervical cancer is bound up, not only with the advancing age of the patient, but with the condition of marriage, and also with the condition of partity, and especially of marked multiparity.

Cervical cancer does not follow soon after the last pregnancy. The time that had elapsed in 285 cases is shown in the subjoined table; only 8.7 per cent were observed within less than a year after the last pregnancy, while in 60 per cent ten years and upwards had elapsed, and in no less than 29 per cent the last pregnancy dated back twenty years and upwards. Thus while the disease appears to be linked in causation with the partity of the patient, the intermediate link is usually a long one, and by analogy with other cancers, as, for instance, of the tongue or vulva, it appears probable that a long-continued local irritation or pathological change of some kind is present in the great majority of cases.

CARCINOMA OF THE CERVIX. TIME ELAPSED SINCE LAST PREGNANCY

Noted in 285 Cases			
Less than 1 year	.	.	25 = 8.7 per cent
2 to 5 years	.	.	49 = 17.1 "
6 to 9 years	.	.	39 = 13.6 "
10 to 14 years	.	.	47 = 16.4 "
15 to 19 years	.	.	42 = 14.7 "
20 and upwards	.	.	83 = 29.1 "

Etiology.—The intermediate link was formerly supposed to be found in the lacerations which take place in labour, and, as might be expected, lacerations are frequently found in association with cervical cancer. It has been objected that lacerations are as frequent in the first labour as in subsequent ones, and that, therefore, uniparity should be as efficient a cause of cancer as multiparity. Moreover, if the lacerations are the cause, cancer might be expected to begin in or near them; but if this occurs at all it is extremely rare, cancer beginning anywhere on the surface



FIG. 243.—Erosion, with many glands and much small-celled infiltration, especially on the surface. The squamous epithelium is thickened, and shows marked down-growths before rapidly thinning off as it approaches the edge of the erosion. ($\times 80$.)

except at a laceration. The connection is probably closer with chronically inflamed eversion and erosions of the cervix, which often persist for very many years. These are more likely to become unhealthy and persistent in proportion to the number of children a woman bears, and as multiparity is undoubtedly a factor in the causation of cervical cancer, as the tumour in the majority of cases does not begin to grow until many years after the last pregnancy, and as, moreover, cervical cancer frequently originates in the near neighbourhood of the external os on an eversion, it seems at least probable that long-continued irritation and chronic inflammation may be the conditions that pave the way for the origin of the new growth.

The systematic examination of erosions and eversions reveals marked differences in structure. In many cases no signs of inflammation are present, and the appearances suggest that the usual covering of the vaginal portion of the cervix has simply been replaced by one continuous with, and similar to, that which normally lines the cervical canal. Sometimes there appears to be a marked increase in the number of glands or in their complexity, or in both these respects (Fig. 243). In other cases the surface of the erosion is papillary from the active proliferation of the interglandular tissue. In many erosions rounded retention-cysts up to the size of a pea

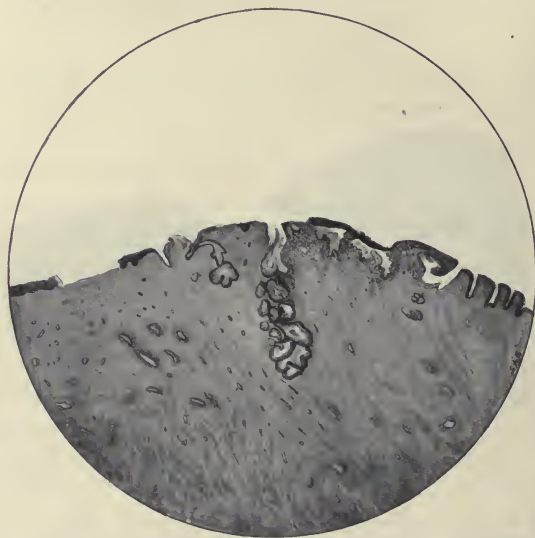


FIG. 244.—Partially healed erosion; the surface is much infiltrated in patches with small round cells; glands are seen extending to some depth from the surface; portions are covered by areas of new-formed and thin stratified squamous epithelium. ($\times 29$.)

are present, lined by a single layer of epithelial cells, flattened in proportion to the size of the cyst. Great differences are observed also in respect to the presence of signs of inflammation; in many cases there are none; in many others infiltration of the superficial layers of the interglandular tissue with round cells, and evidences of activity and desquamation of the epithelial cells are marked (Fig. 244).

In the process of so-called healing many variations are also to be distinguished. Sometimes the healing appears to take place smoothly and to lead to a complete restitution of the normal covering; the glands all disappear and the surface-epithelium becomes regularly stratified and squamous. In other instances the healing

leaves scattered glands, singly, or in collections, under the new-formed stratified

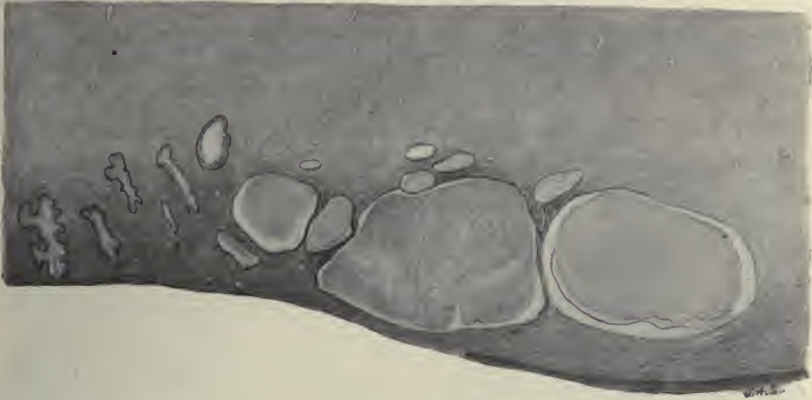


FIG. 245.—The healing border of an erosion, showing a group of cystic glands in the portion covered by stratified squamous epithelium. ($\times 29$.)

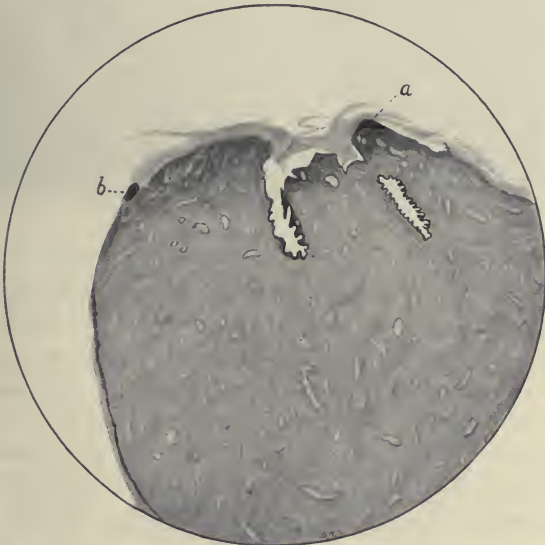


FIG. 246.—Section of an erosion showing much infiltration with lymphocytes and plasma-cells; the epithelium gradually thins as it approaches the edge of the erosion, and becomes broken up and irregular, showing proliferative thickenings here and there. ($\times 29$.)

epithelium, and these glands show various stages of degeneration and cyst-formations

(Fig. 245). Again, the regeneration of the epithelial covering may be imperfect, resulting in the formation, over greater or smaller areas, of a several-layered covering of rounded and irregular cells that fail to show a regular squamous evolution. The most striking factor common to nearly all the variations in connection with so-called erosion is the extreme chronicity of the processes.

It is at least probable that among these manifold changes some may ultimately be discerned that definitely predispose to the occurrence of cancer, that represent in fact *pre-carcinomatous conditions*, comparable to those found in certain other situations (Figs. 246 and 247). Bonney¹ has dealt fully with the connective-tissue

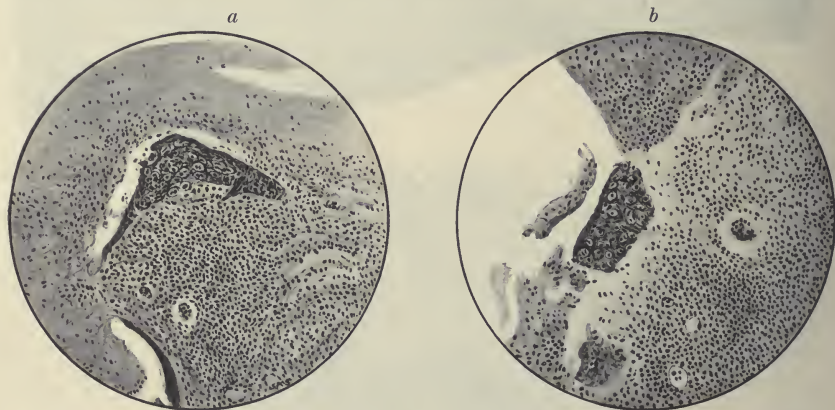


FIG. 247.—Some of the irregular proliferations of epithelium from the erosion in Figure 246. ($\times 209$.)

changes that precede the onset of cancer in various parts of the body. He states that in all cases of early cervical cancer examined by him there was evidence of erosion and cervicitis, and that, if looked for, signs of the old condition can be found also in advanced cases (cf. Fig. 248). The pre-carcinomatous state is one of chronic inflammation characterized by the presence of lymphocytes and plasma-cells in the subperitoneal tissue, together with the disappearance of elastin and collagen and with epithelial hypertrophy. Carcinoma may begin in the squamous epithelium or in hypertrophied cervical glands; in either case the development of malignancy appears to bear some relation to the altered conditions that obtain in long-continued cervicitis.

The exact relation between the pre-carcinomatous state and the inception of cancer still calls for elucidation; it may be, of course, that the one condition passes

¹ Bonney, *Lancet*, 1908, vol. i. pp. 1389 *et seq.*

immediately into the other, or even that the pre-carcinomatous condition is already malignant; on the other hand it is probable that the real pre-carcinomatous condition is one that merely prepares the ground, so to speak, in which the cancer-seeds are enabled to germinate; or, further, it is conceivable that the condition represents the first attempt of the body to protect itself against cancer that is already implanted, or is in process of evolution. The difficulties of interpretation may usefully

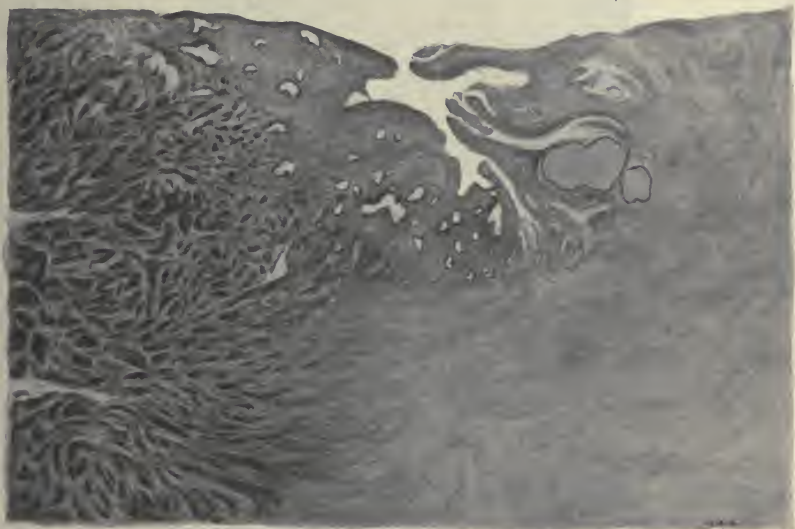


FIG. 248.—The cervical mucous membrane bordering on a solid alveolar carcinoma. Two small cysts filled with inspissated mucus are seen on the right. The mucous membrane, which is continued over the surface of the tumour, is gradually thinning off. Under a higher power it is seen that while the gland-epithelium is generally well preserved, it has largely disappeared from the glands in a thin layer bordering the growth. ($\times 20$.)

be illustrated by a description of the appearances in the earliest case of cervical cancer that I have hitherto observed.

CASE 2. A woman, aged 47, whose fifth child was born fourteen years previously, complained that for about a year the catamenia had been more profuse, and that a fortnight ago at the end of a regular period there had been a profuse flooding. A pedunculated mucous polypus about 1 cm. in diameter, which projected from the external os, was removed with scissors. On the free end of the polypus was a small irregular dark patch, which on microscopical examination showed the changes presently to be described.

The uterus and its appendages were removed by the extended abdominal operation one month later. Both ovaries and tubes were closely adherent; there was an enlarged

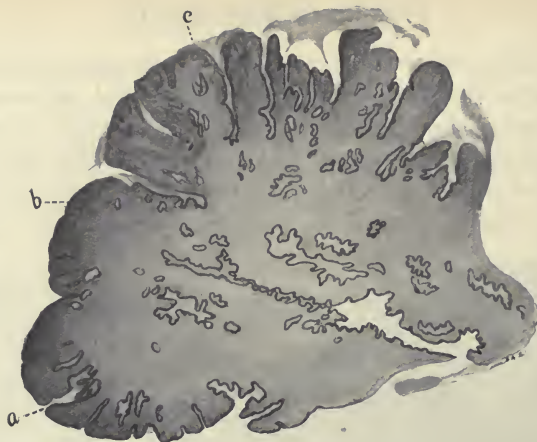


FIG. 249.—Section of mucous polypus of cervix. The greater part shows the ordinary simple structure, and is covered by a single layer of columnar epithelium. Above and to the right the surface folds are congested, necrotic, and inflamed. From *a* to *b* the epithelium on the surface is in several layers, like an imperfectly developed stratified squamous epithelium. From *b* to *c* a solid alveolar cancer is developing. ($\times 9$)



FIG. 250.—Portion from *b* to *c* in Figure 249. The surface here is covered by a well-developed stratified squamous epithelium with numerous irritative down-growths; these, and the deeper layers of the surface-epithelium are made up of well-developed prickly-cells. In the deepest part of the field at *d* the processes of epithelial cells are ill defined at their margins; the cells have lost their prickles, and appear to be proliferating into the surrounding connective tissue. ($\times 29$)

obturator gland on the right side, microscopically proved to be non-malignant. No evidence of malignant disease was found on careful examination of the removed uterus. The patient remained free from recurrence three years after the operation.

Examined under a low power the section, except at part of the apex, shows the structure of a simple glandular polypus, with large acini lined with a single layer of secreting epithelium (Fig. 249). The surface shows folds and papillae for the most part covered with a similar epithelium. The ends of the papillae at the distal part of the section are congested and swollen, and show great infiltration with cells which are mostly lymphocytes and large oval and round cells with excentric and relatively small nuclei; polymorphonuclear leuco-

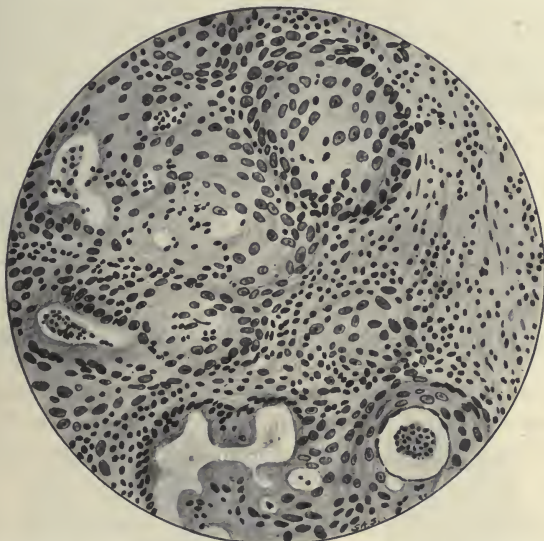


FIG. 251.—From the deepest part of Figure 250. Shows sections of proliferating collections of epithelial cells.

cytes are comparatively few. Adherent to the surface in places is a mass of fibrin and blood-clot with large numbers of polymorphonuclear leucocytes.

The free end of the polypus shows remarkable appearances in connection with the epithelial covering. The single layer of cylindrical epithelium gives place to a covering of about half a dozen layers of irregularly flattened and oval cells with nuclei long and oval on section, parallel with the surface, and varying much in size—an imperfectly developed stratified squamous epithelium. This epithelium traced onwards over the surface becomes thicker and better developed, but not uniformly so, and it extends deeply into the clefts on the surface.

At the apex the stratified epithelium is thickest and best developed, and sends numerous prolongations downwards into the underlying connective tissue (Fig. 250). The deeper

layers of the epithelium, and the down-growths, are formed of well-developed prickle-cells, and are sharply defined from the connective tissue which is here infiltrated with lymphocytes and plasma-cells. Deeper than the epithelial down-growths, other collections of epithelial cells are seen with ill-defined borders, as if the cells are proliferating into the surrounding tissue. The cells are less differentiated and do not appear to be provided with prickles (Fig. 251).

The specimen is one of early epithelioma developing in a mucous polypus of the cervix, but whether the explanation of its origin is to be found in the metaplasia of the cylindrical epithelial covering, first into a many-layered, then into a well-developed stratified squamous epithelium, from which finally the cancerous tumour has begun to proliferate; or whether the growth is due to some kind of tumour-germ derived from without; or finally, whether the tumour is due to implantation from a pre-existing one, cannot be determined. The down-growths of prickle-cells may be merely irritative, but the deeper collections of cells appear undoubtedly to be malignant; a possible interpretation is that the epithelioma has first taken root and that its presence has given rise to the metaplasia and irritation of the epithelium.

Solid Alveolar Cancer of the Cervix; its Growth and Spread

Of a total number of 529 cases of cervical cancer, 136 were treated by radical operations; 10 of these were proved to be adenocarcinomata, and will be treated separately; the other 126 had the structure of solid alveolar carcinoma, and are first considered.

Cervical cancer may be presumed to originate in a small group of cells in close relation with pre-existing surface or glandular epithelium. It may start at any part of the surface of the vaginal portion or of the canal of the cervix, but most commonly begins at or near the external os. Once it has begun it grows and extends by multiplication of its own epithelial cells, and these draw their nourishment from the neighbouring connective tissue, which forms the stroma of the tumour in response to a stimulus, probably biochemical, from the epithelium (Fig. 252). The stroma carries new blood-vessels and lymphatics and forms a supporting scaffolding to the epithelium. The growth of the epithelium is in advance of and disproportionate to the stroma-formation; hence arise the manifold degenerations and the haemorrhages that attend the increase in size of the tumour. The great epithelial proliferation leads further to complicated folding and crumpling of the surface of the tumour, and to pushing aside, flattening, and stretching of the neighbouring soft tissues (Fig. 253).

Extension of the growth takes place in all directions : upwards away from the surface towards the cavity of the cervix or vagina—*exophytic* ; deeply into the walls of the cervix—*endophytic* ; and *laterally* over the surface. The extension is not

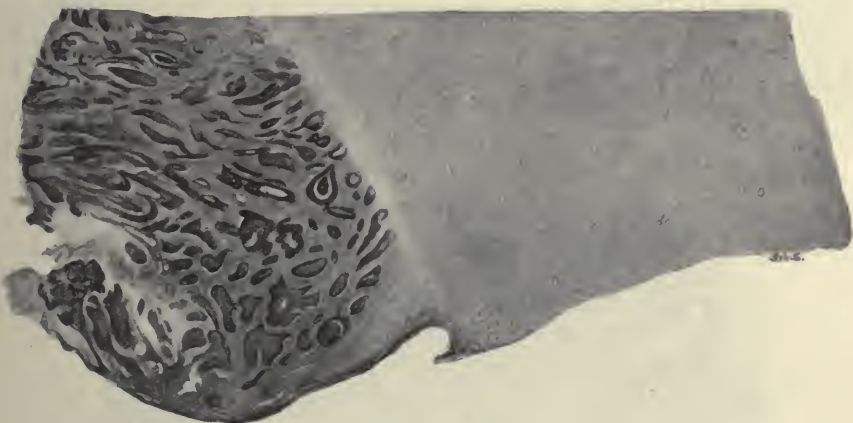


FIG. 252.—The arrangement of the alveoli in a solid alveolar carcinoma. The mucous membrane is continued for some distance over the surface of the tumour, is much thinned, its few glands are parallel to the surface ; an uninvaded zone of connective tissue separates it from the surface of the cancer, and this has taken the stain less than the rest of the uterine wall. ($\times 8$.)



FIG. 253.—A raised granular surface on one lip of the cervix ; the base is formed by a plaque of opaque greyish-white new growth, which appears to have everted or opened up the end of the affected cervical wall. Squamous epithelioma.

uniform, being favoured in certain directions by diminished pressure or by favourable nutritive conditions, and hindered in other directions.

As the tumour expands and grows, it infiltrates the surrounding tissues by pushing out roots into the natural interstices, especially into the lymph-spaces

devoid of endothelial lining. Soon, the farthest-growing rootlets find the lined lymphatic vessels, and proliferate freely along them ; permeation is added to infiltration (Fig. 254). Whether permeation then, as a rule, proceeds continuously, as has been described by Handley in breast cancer, or whether the invasion of the lymphatic vessels is discontinuous, separate foci, with free intervals, being formed by a process of embolism, is not clear. If continuous permeation is the rule, large portions of the invading cords are strangled and disappear, presumably by endothelial proliferation and by fibrosis. At any rate, it is usual in moderately advanced cancer to find

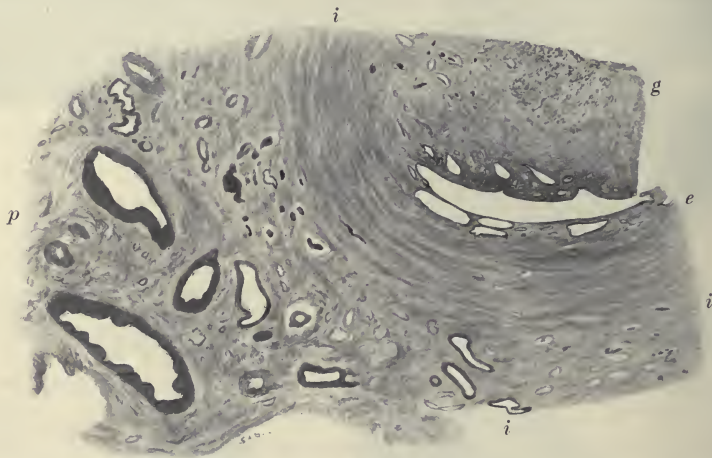


FIG. 254.—Transverse section through isthmus (*i*) and parametrium (*p*). The growth (*g*) has involved the upper (in diagram) wall of the cervix ; at one side, and in the parametrium, are numerous large lymphatics filled with cancer-cells. The endometrium (*e*) shows signs of atrophy and cystic degeneration of glands.

separate and disconnected foci in the uterine wall as well as in the surrounding connective tissue.

By infiltration and lymphatic permeation the cancer extends into the thickness of the cervical wall, upwards towards the body of the uterus and outwards towards the connective tissues. At the same time, the growth often spreads along the surface, a tendency that appears to be more marked in cancer beginning in the vaginal portion, where the spread frequently takes place along the vagina, and does not reach the parametrium so early as does cancer beginning in the cervical canal. In the cervical canal extension readily takes place outwards through the thickness of the wall into the surrounding connective tissue, as well as upwards towards the body of the uterus.

In nearly half the operable cases the cervical cancer has already spread to the *body of the uterus* in one or both of the following ways (Fig. 255). Along the surface the extension often appears to halt at the isthmus, but only for a time. By way of the large lymphatics in the outer layers of the muscular wall the cancer readily spreads upwards and not uncommonly extends to a higher level in the muscular coat of the body than in the endometrium; the latter is sometimes invaded through its deeper layers by the extension in the muscular coat (Fig. 256). In the advanced



FIG. 255.—Endometrium covering the surface of an extension of cervical cancer, much thinned, and with the few glands parallel to the surface. ($\times 80$.)

stages of the disease the whole uterus may be involved so that it is impossible to say whether the growth began in the body or cervix of the organ.

Sometimes a separate focus of cancer is found in the endometrium at a distance from the cervical lesion.¹ In some of these cases the growth in the body is secondary to the cervical cancer; in others the cervical focus is metastatic either by the lymphatics or by implantation; and in still others the lesions are both primary and independent.

Cervical cancer spreads in several ways beyond the uterus to other organs and

¹ Jellett, *Lancet*, 1907, vol. i. p. 94 (case of cancer of cervix and fundus); Cullen, *loc. cit.* p. 592 (6 cases of cancer of cervix and fundus).

tissues. By continuity, it commonly extends to the connective tissues, the vagina, bladder, and rectum. By lymphatic permeation, it either grows continuously or gives rise to secondary nodules in various places; lymphatic emboli of the cancer-

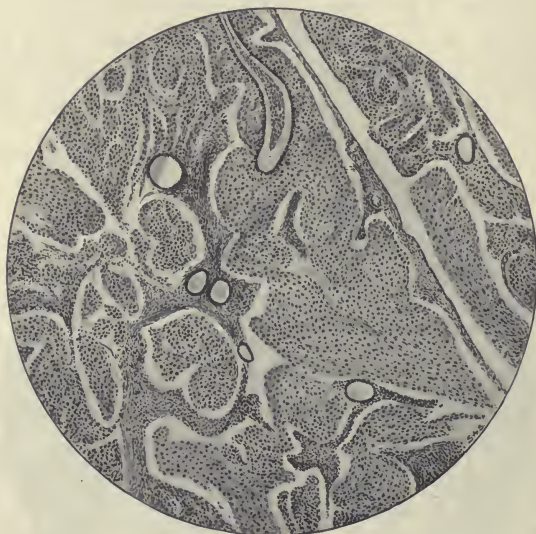


FIG. 256.—A very cellular solid alveolar cancer with much keratoid degeneration has invaded the endometrium from below, engulfing numerous glands. The growth has penetrated the walls of some of the glands, as is seen in the upper part of the drawing, where a large collection of malignant epithelial cells has penetrated along the lumen of a gland lined by a single layer of cubical epithelial cells.

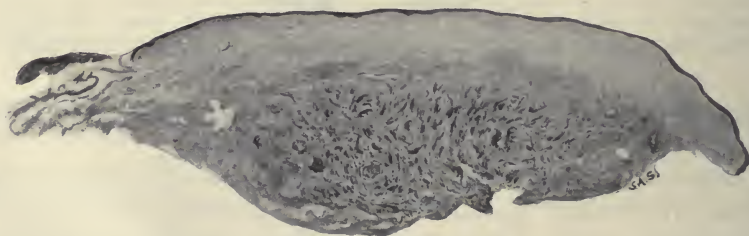


FIG. 257.—Lymphatic metastasis in wall of vagina. The uterus was fixed by a cervical cancer invading the left broad ligament and posterior wall of the vagina. The growth was curetted and cauterized, and the outlying vaginal nodule excised. ($\times 8$.)

cells may originate metastases at a distance from the primary focus. After the overthrow of a very real natural immunity, cancer-cells may invade the blood-stream and send emboli capable of causing metastases to distant parts of the body. By

surface-contact, the tumour may originate metastases on the vagina, vulva, or urethra.

The *vagina* may be invaded along the surface, or by way of the lymphatics in its muscular wall (Fig. 257), or in both these ways. It is involved in almost half the operable cases, and is more apt to be invaded when the cancer begins on the vaginal portion of the cervix. When the growth is exophytic, the tendency to invade the vagina appears to be less marked, and is superficial when it occurs (Fig. 258). Endophytic growths, beginning in the canal or in the vaginal portion, extend to the vagina



FIG. 258.—One wall of the cervix in its lower two-thirds has been entirely destroyed by ulceration of a new growth which has invaded and partly destroyed the vaginal wall. The muscular coat is destroyed to a higher level than the cervical mucous membrane, the remains of which form a tongue-like projection downward. Ulceration has extended over the mucous surface of the other cervical wall.

mostly by way of the lymphatics. Vaginal metastasis by implantation is by no means rare in cervical cancer, and is illustrated in Figure 259, for which I am indebted to Dr. Cuthbert Lockyer. In the drawing no appearance of the cervical tumour is seen; a large growth was removed by curetting before the extended abdominal hysterectomy by which the specimen was removed; the implantation tumour arose on the posterior vaginal wall at a part in contact with the cervical growth. In the later stages of cervical cancer the whole length of the vaginal wall is not uncommonly infiltrated, especially anteriorly, where the whole base of the bladder and the urethra may also be involved.

The *pelvic connective tissue* is involved at a comparatively early stage of cervical cancer. Schottlaender and Kermauner found the parametria involved in three-fourths of the specimens removed by operation. The connective tissue in front of, and behind, the cervix is found to be invaded as soon as the parametrium. The invasion takes place early by permeation, and at a later stage by infiltration when the growth has extended through the whole thickness of the cervical wall. In



FIG. 259.—Dr. Cuthbert Locker's specimen. *Implantation-Metastasis.* From an extended abdominal hysterectomy. The figure shows an implantation-metastasis on the posterior vaginal wall, secondary to a large cervical cancer, which was scraped and cauterized prior to the operation.

permeation active growth occurs only here and there, so that discrete nodules are formed which expand and coalesce at a later stage. These nodules tend to be spherical, and they are sharply circumscribed and often movable in the early stages of their growth; the surrounding connective tissue shows no active changes (Fig. 260).

In rare cases the *pelvic peritoneum* is affected at a comparatively early stage of cervical cancer. Thus in a case reported by Violet and Adler,¹ a friable cancerous ulcer was curetted, and as the uterus was movable, and the fornices free, the abdomen

¹ *Annales de Gynécologie et d'Obstétrique*, July 1905.

was opened with a view to removal of the uterus. A metastatic deposit, as broad as the palm of the hand, was found in the subserous tissue of the lower part of the parietal peritoneum extending downwards to the bladder, and in the peritoneum itself were two isolated masses as large as cherries, which were found on microscopic examination to be cancerous.

The muscular wall of the *bladder* is not rarely invaded from without, and in specimens removed by operation, bladder-muscle can sometimes be easily recognized.

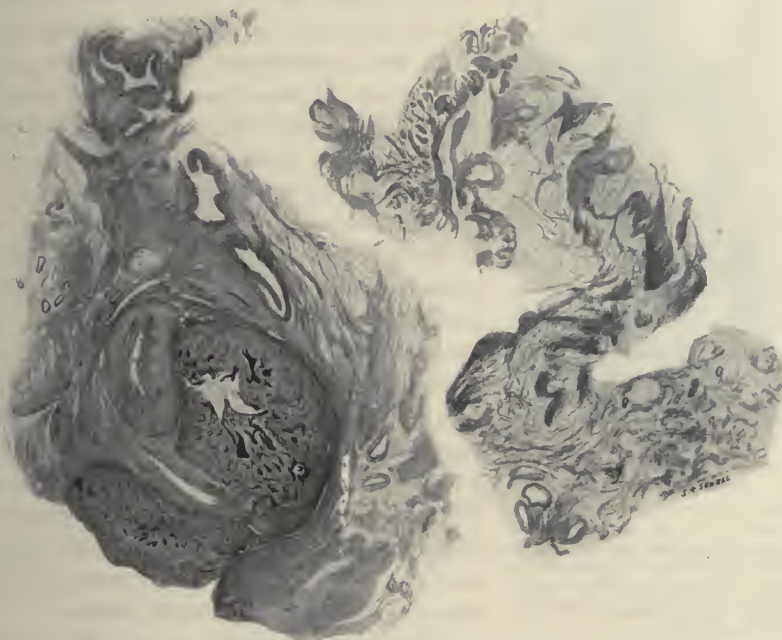


FIG. 260.—Lymphatic metastasis in parametrium from a case of cervical cancer. ($\times 8$.)

Frequently, difficulty is experienced in separating the bladder, and not uncommonly the wall is torn during the removal of a cervical cancer. In the later stages of the disease, the growth commonly invades the mucous membrane and forms nodules in the floor of the bladder behind the trigone, and in the neighbourhood of the ureteral openings. The extension of ulceration in this direction may give rise to malignant vesico-vaginal fistula.

The *ureters* are frequently affected by cervical cancer, and their obstruction is the most frequent cause of death. According to Albers-Schonberg the ureters are

dilated, and hydronephrosis is present in 40·2 per cent, and according to Leitch in 75 per cent of all cases. In operable cases, the results of compression of the ureters may already be so marked, as to interfere with the success of the operation by predisposing to septic infection or to uraemic symptoms. Interference takes place as the ureters pass from without and behind, forwards and inwards, through the connective tissue at the base of the broad ligaments,



FIG. 261.—Distended right ureter in a case of cervical cancer.

The ovary and outer end of the Fallopian tube were firmly adherent to the side of the pelvis, and the exploratory laparotomy did not decide whether the distension was due to cicatrization, following old inflammatory exudation, or to malignant infiltration of the parametrium.

and may be brought about in various ways, by simple pressure exerted by the growth of cancer around the ureters, or by actual invasion of the walls from without, the cancer permeating the lymphatics. In some cases an old pyosalpinx, or atrophic salpingitis with surrounding cicatricial contraction, has already strangulated the corresponding ureter (Fig. 261).

The effects of pressure on the ureters are seen in dilatation, first of the ureter, and then of the pelvis of the kidney, with consequent pressure on, and thinning of, the kidney substance; the condition of hydronephrosis thus induced is particularly prone to infection by pyogenic organisms, which in turn lead to pyelonephritis and sometimes to diffuse suppuration of the kidneys. In the absence of infection, the pressure may be so long-continued and severe as to give rise to renal inadequacy and even to uraemic convulsions. Occasionally the pressure may give rise to complete suppression of urine, which forms the closing clinical picture.

The *rectum* is rarely invaded in the earlier stages of cervical cancer; later, especially where the disease chiefly affects the cervical canal, extension of the growth along the uterosacral folds surrounds and infiltrates the walls of the gut, and, not uncommonly, leads to the formation of a rectovaginal fistula.

The *ovary* is rarely implicated in cancer of the cervix, though metastasis as the result of retrograde lymphatic embolism has been observed.

The *Fallopian tubes* may similarly be involved by way of the lymphatics in the mesometrium; they are much more commonly invaded by the extension of growth along the lymphatics in the outer layer of the uterine wall; and rarely, the lumen

also is invaded by continuous growth extending along the surface from the uterine cavity.

The Uterine Lymphatics.—The lymphatics of the uterus arise in three capillary networks in the mucous membrane, in the muscular coat, and in the peritoneum. From all these, according to Poirier and Cunéo, branches run to the subperitoneal tissue and anastomose on the surface of the uterine muscle to form a fourth network, from which the connecting trunks arise. The plexuses of the body and cervix are continuous, without any line of separation, but their connections may be studied separately.

In the mucous membrane there are no definite lymph-vessels; the lymph flows in unlined spaces between the cells of the stroma. Certain flat cells are compared by Leopold to endothelial cells and are often found in collections, especially in the glands and on the walls of the blood-vessels, which thus, in part at least, appear to be surrounded by lymph-sheaths.

In the middle and outer layers of the muscular coat numerous large lymphatic vessels are found, along with the larger blood-vessels, and through them free communication is established between the lymphatics of the body and of the cervix. In the inner layers of muscle, towards the mucous membrane, the lymphatic vessels are notably smaller.

The lymphatic collecting trunks of the *cervix*, five to eight in number, converge towards the side of the isthmus, and, after leaving the organ, are twisted and dilated to form a large lymphatic node, which is not to be mistaken for a gland. This juxta-cervical node is often absent in the new-born, but is always well developed in pregnancy.

Three sets of cervical lymphatic collecting vessels are distinguished by Poirier and Cunéo :

1. External iliac, transverse, or praeureteric : Two or three trunks run first directly outwards accompanying the uterine artery; soon, leaving the vessel, they course up the lateral pelvic wall, crossing inside the internal iliac artery to terminate in the middle and superior glands of the middle chain of the external iliac group.

2. Internal iliac or hypogastric : One or two trunks pass behind and below the ureter, and are directed obliquely upwards, backwards, and outwards to terminate in a gland of the internal iliac group, which is commonly situated on the anterior terminal branch of the internal iliac artery, at the level of origin of the uterine and vaginal arteries.

3. Lateral sacral : Two or three trunks spring from the posterior surface of the cervix, at first descend upon the vagina, and then run backwards in the uterosacral

ligament ; the external shorter trunks join the lateral sacral glands, and the internal longer, pass to the glands of the promontory.

From the *body of the uterus* three sets of lymphatic collecting vessels also issue :

1. The principal group comprises four or five trunks which appear below the cornu and at first follow the terminal segment of the uterine artery ; they then pass below the level of the ovary, receiving its vessels, and accompany the ovarian vessels through the ovario-pelvic ligament and up towards the lumbar region, crossing in front of the ureter. A little below the hilum of the kidney the vessels curve sharply and "descend in showers" upon the juxta-aortic glands of the same side, some of them reaching the pre-aortic group.

2. External iliac : One or two trunks arise a little below the uterine cornu and run directly outwards to join glands of the middle chain of the external iliac group, which thus receives lymphatics from the body as well as from the cervix.

3. Inguinal : Branches join the lymphatics of the Fallopian tube and round ligament, and terminate in one of the upper and internal group of superficial inguinal glands.

An obturator gland is sometimes described ; according to Poirier the gland usually so called is the middle one of the inner chain of the external iliac group, which is situated behind and below the obturator foramen, and at some distance from it. He agrees with Sappey that no lymphatics from the uterus join this gland.

The lymphatic tracts of the cervix drain into the inter-iliac, the internal iliac, and the pararectal glands. Leitch¹ has investigated the records of 915 complete *post-mortem* accounts of cancer of the cervix, and states that the inter-iliac glands are by far the most important group. These are described in two sets ; three or four lie between the external and internal iliac arteries, the uppermost being usually hidden by the ureter ; these glands communicate, by a connection over the artery, with another set of three or four along the outside of the common iliac artery. He finds a large obturator gland closely connected with the inter-iliac group and lying between the external iliac vein and the obturator nerve.

The lymphatics of the cervix and body of the uterus freely communicate by the continuity of their plexuses of origin, as well as by anastomoses between the lymphatic trunks along the sides of the organ. They also anastomose with those of the neighbouring organs, especially those of the vagina, and through them with the rectal lymphatics ; and with those of the broad ligament, tubes, ovaries, and round ligaments.

The uterine lymphatics vary enormously at different ages ; relatively few and small until puberty, they become abundant and large in adult sexual life, especially

¹ Leitch, *Transactions of the Royal Society of Medicine (Obstet. and Gyn. Sect.)*, December 1, 1910.

during pregnancy and in the puerperium ; after the menopause the lymphatic supply becomes diminished progressively with advancing age. In the last change is found one of the chief explanations of the fact that cancer of the body of the uterus is, as a rule, slower in its growth and more favourable as regards treatment than cancer of the cervix.

The involvement of the lymphatic glands in cases of uterine cancer shows great inconstancy. In women dead of the disease Blau¹ found diseased glands in 33 per cent. Roger Williams in 78 cases found the regional glands involved in 56 ; the ileo-pelvic glands were affected in 44 cases, in 24 of which the disease had spread upwards to the lumbar group. The inguinal glands were involved in 6 cases ; in 20 the pelvic glands only, and in 2 the lumbar only were diseased. In no less than 28 per cent of women dead from uterine cancer the glands were not infected. Leitch finds that 55 per cent of the cases of cervical cancer are free from any glandular or visceral metastasis outside the pelvis.

In abdominal operations for uterine cancer the glands are found to be cancerous in about one-third of the cases, and enlarged, but not cancerous, in about another one-third. Malignant invasion of the glands, as a rule, does not take place until the broad ligament is definitely invaded, but this rule appears to be subject to numerous exceptions ; the broad ligaments frequently show cancerous invasion while the glands are still free. The glands become infected at an earlier stage in cancer of the cervix than in cancer of the body. It is important to bear in mind that the nature of the glandular enlargement cannot be determined by the naked-eye appearances, or by the consistence. Large hard glands may be found free from cancerous invasion, while small and apparently normal glands may prove to be already infected. The non-malignant swellings are due to irritation, sometimes to septic invasion of the cancer, and occasionally to old mischief ; in at least two of my cases the glands were tuberculous, and Schottlaender found tuberculous non-malignant glands in three of his cases. In some instances, possibly, the enlargement may be due to the irritation of pre-cancerous changes in the cervix.

Certain cavities lined by a single layer of cubical or columnar epithelium are commonly found in the glands removed in uterine cancer, and their nature has given rise to much discussion. They have probably no malignant significance, as has been suggested ; neither is it likely that they are derived from the Wolffian bodies. Some of them are possibly inclusions from the peritoneum, such as are commonly seen on the Fallopian tubes, broad ligaments, and uterus ; and others may be derived from lymphatic vessels whose endothelium has become altered, probably by irritation.

¹ Blau, *Dissert.*, Berlin, 1870 (93 *post-mortem* examinations).

Invasion by the Blood-vessels.—The veins of the uterus are very thin-walled, so that on section they appear to be mere clefts in the muscular wall of the body of the uterus, where there is a close plexus of large veins, the largest being found under the peritoneum on the posterior surface. From this network large vessels run outwards to the side of the uterus to enter into an extensive plexus placed along its lateral walls and to the vagina on either side—the utero-vaginal plexus. At the level of the internal os two uterine veins arise from this latter plexus on either side; they accompany the uterine artery, one passing with the artery in front of the ureter, and the other behind. The uterine veins join with the collecting trunks of the vesico-vaginal plexus to form a common stem, which also takes up the obturator vein and then joins the internal iliac. The uterine veins receive branches from between the layers of the round ligaments, and through these, they communicate with veins in the abdominal walls and in the external genital organs; finally they communicate with the veins of the tube and ovary, with the ovarian veins, with those of the bladder and vagina, and through these, with the veins of the pelvic floor, rectum, and external genitals.

From the ovary, tube, and upper part of the broad ligament, the blood is collected by a number of veins which form the large pampiniform plexus between the layers of the mesosalpinx. The vessels from this plexus terminate in the ovarian vein which runs upwards along with the ovarian artery into the lumbar region, where the right ovarian empties itself into the vena cava, and the left into the left renal vein.

The invasion of the blood-vessels by cancer appears to be more frequent than has been generally recognized. Where the veins are invaded, emboli pass immediately through the heart to the lungs. Schmidt¹ has made observations on 41 cases of carcinoma with special reference to the dissemination by the blood-stream. In 15, carcinomatous emboli were found in the small arteries of the lungs. It appears that in cancer of abdominal organs, metastatic groups are frequently arrested in the pulmonary arteries, but that only a small proportion of these cell-masses give rise to metastatic growths in the lungs, or break through the vessel-wall into the perivascular lymph-stream. The greater number are destroyed by the organization of the thrombus surrounding them, or are encapsuled and rendered inert. A small minority grow forwards, through the surrounding thrombus, to the capillaries and small veins, and by getting into the general circulation may be carried to any remote part of the body. The method of invasion by the blood-vessels may give rise, in certain cases, to a rapid and very widespread generalization of the disease, leading to a rapidly fatal termination.

¹ Schmidt, *Brit. Med. Journ.*, 1904, vol. i. p. 851.

Adenocarcinoma of the Cervix

Incidence.—Cullen found adenocarcinomatous tumours in 19 cases out of 147 of cancer of the cervix, and Kermauner in 11 out of 117. Among my 136 radical operations for cervical cancer 10 of the tumours proved to be adenocarcinomata,

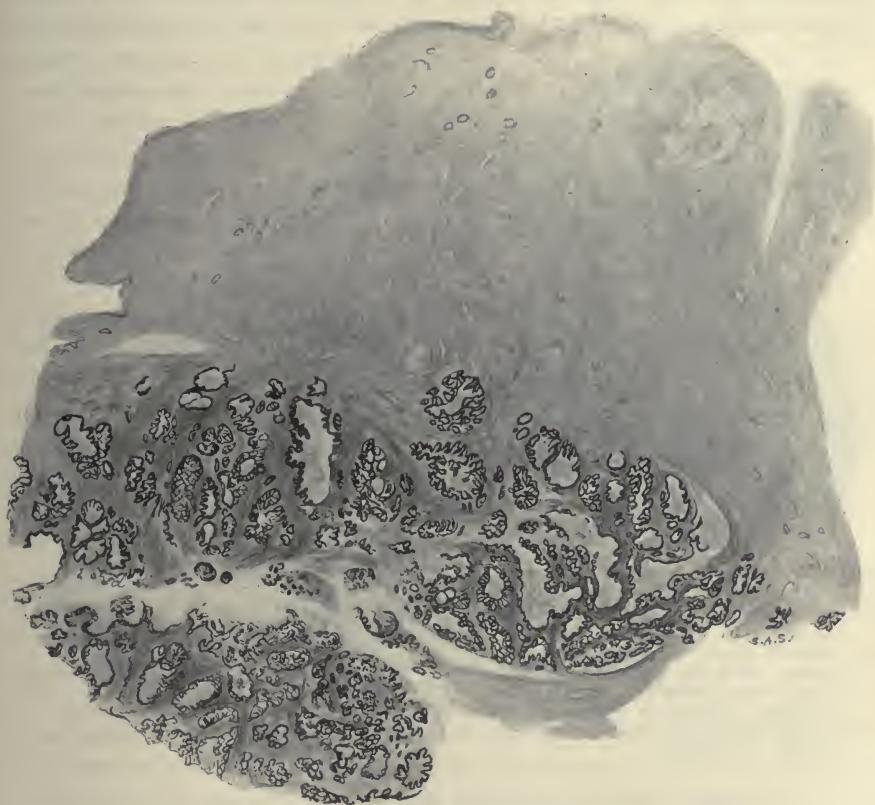


FIG. 262.—Adenocarcinoma, everting, of the cervix.

and in 2 palliative curettings similar structures were found (Fig. 262). The 12 patients varied in age from twenty to sixty-six, 6 of them being between thirty-five and forty-four, and 4 fifty-five and upwards. Cullen observed 3 of his cases in coloured women, and concludes that this form of cervical cancer is equally prevalent in them as in white women. Ganghofner has reported a case in a child of eight. Of my cases the patient of twenty was single, the others all married; 4 of the latter

had more than five pregnancies, and 2 others more than ten. Four of the women, including the single one, were nulliparous. The disease made its appearance before the menopause in 8 cases; 1 patient stated that her periods had been regular until the age of sixty-four—two years before the cancer was discovered; the other 3 had passed the menopause nine, ten, and twenty-two years respectively. In 1 patient the last delivery was one and a half years before the operation; in 6 a period varying



FIG. 263.—Adenocarcinomatous ulcer in the anterior wall of the cervical canal extending upwards for about one inch from the margin of the external os. From XI-para, aged 61, twenty-two years after the menopause. Red and yellow discharge and frequent micturition for two years before operation; increase in weight. Patient remains well more than twelve years after vaginal hysterectomy.

from seven to twenty-four years had elapsed since the last pregnancy. It appears, therefore, that the relationships between adenocarcinoma of the cervix and the age and parity of the patient, the time of the menopause, and the period that has elapsed since the last delivery, are all similar to those obtaining in solid alveolar carcinoma of the cervix.

Symptoms.—In agreement with Cullen it may be stated that initial symptoms are often indefinite or even absent. In 3 of my cases symptoms had existed from seven to eleven months, and in 6 from one to two years or longer. In only 1 case was the duration of symptoms given as less than two months; in this the woman stated she had had severe loss and bearing-down for two weeks only, and a rounded lump was present in the posterior lip. The first symptom observed by the patient in two-thirds of the cases was bleeding, or the presence of a brown or bloody discharge; in 2 cases there were gushes of clear watery fluid, and in 2 the first symptoms were pain and

yellow discharge. Pain was one of the first symptoms in one-third of the cases. In the majority of cases, however, pain appears to be a late symptom, since in 7 of the 12 none was complained of. The bleeding may be profuse from the first, or there may be merely a slight continuous red discharge; in the later stages profuse hæmorrhages occur from time to time, and may come on without any obvious cause, though they are most common after straining or exertion. Among the general symptoms noted there was marked anaemia in 2 of the cases. The state of nutrition varied; in 3 of the women there was said to be no change, in 2 there was

wasting. In the other 7 not only was there no wasting when the patient applied for treatment, but, on the contrary, 2 of them had become fatter, and 2 others might fairly be described as obese.

Characters.—The gross lesion present formed in 7 cases a cauliflower mass, usually soft and friable, easily breaking down and bleeding. In six of these the mass was attached to the end of one or both lips of the cervix; in the seventh it projected like a polyp from the external os.

In 4 cases there were ulcers (Figs. 263-266), three in the cervical canal, and in the

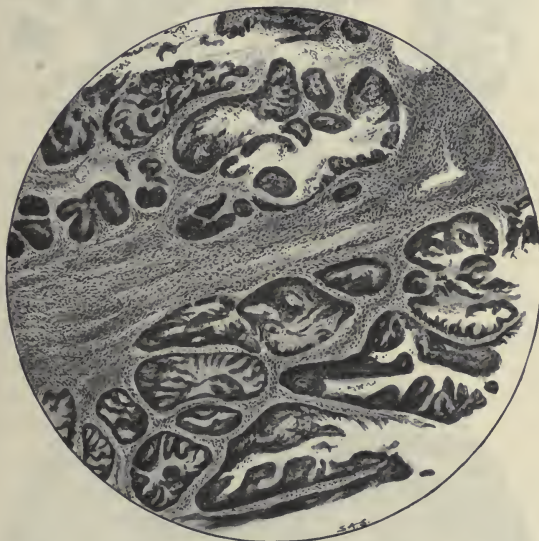


FIG. 264.—Section of growth from Figure 263. ($\times 132$.)

fourth a detached crateriform depression with hard edges, not very friable and not easily bleeding. In the twelfth case, already mentioned above, there was a nodular mass in one wall. Invasion of one or both broad ligaments had taken place in two cases. In the seven cases operated upon by the abdominal route pelvic glands were found to be enlarged in three cases, and the lumbar glands in a fourth. Microscopic examination in three of the four proved the glands to be cancerous.

In one of the cases two separate cancerous deposits were present.

CASE 3. The patient was a nullipara of 60, who had passed the menopause ten years previously. A large, soft, velvety friable mass projecting from the anterior lip spread up the cervix and invaded a small fibroid in the posterior wall of the uterus. The fibroid



FIG. 265.—Portion of growth from same case. ($\times 278$.)
Acini lined by irregular epithelium in one to many layers.



FIG. 266.—Another portion of the same tumour. ($\times 278$.)
Acini filled with epithelial cells, many of which show marked keratoid degeneration.

was at the level of the isthmus and had become adherent to the pelvic colon. At the fundus, at a considerable distance from the cervical growth, was a small fibroid polypus partly affected by a similar adenocarcinomatous growth. Whether the two lesions were independent, or whether one was a metastasis, and if so, which growth was primary, must remain undecided.

Among the complicating conditions, fibroids were present in the uterus in two cases; and diffuse adenomyoma of the wall of the body in a third. In one of the fibroid cases there was also double salpingo-oöphoritis with isthmie nodes.

Cullen¹ is of opinion that in adenocarcinoma the tissue is firmer than in solid alveolar cancer, so that the disease is further advanced before breaking-down occurs, and haemorrhage does not take place so readily; and that, therefore, adenocarcinoma is more likely to become inoperable before any distinctive sign arises of its presence. In my cases no difference could be discerned in incidence, symptoms, physical signs, course, or complications between the two forms of cervical cancer, and it appears that the distinction is only possible with the help of the microscope.

Complications of Cancer of the Cervix

The complications of cervical cancer may be classed as essential or consequential, arising out of the progress of the disease itself, and accidental. Among the former may be mentioned as commonly occurring in addition to septic infection: necrosis, and ulceration; fistulae of various kinds, urinary and faecal; and renal affections, including hydronephrosis and suppurative pyelonephritis.

Accidental complications are often met with in the uterus and appendages. Thus cancer may arise in a double uterus. Rossa² describes a case of cancer of the cervix in a V-para of 38 with a bicornute uterus that had been distended into a pyometra by atresia of the vagina. Buist and Valentine³ describe a case of adenocarcinoma in the left body of a double uterus with double vagina, and refer to 6 previously published cases, of which 4 were cancers of the cervix and 1 of cervix and body.

The mucous membrane lining the body of the uterus usually shows the normal menstrual changes, but in about one-seventh of the cases of cervical cancer it is affected by interstitial endometritis. Mucous polypi and polypoid thickenings of the endometrium and cervical mucous membrane commonly coexist with early cancer (Fig. 267).

Fibromyomata are present in a much smaller proportion of cases of cervical

¹ *Loc. cit.* p. 334.

² Rossa, *Centralblatt für Gynäkologie*, No. 18, 1894.

³ Buist and Valentine, *Journal of Obstet. and Gyn. of the British Empire*, February 1914, vol. xxv. p. 88.

than of corporeal cancer. Munro Kerr¹ in 200 abdominal hysterectomies for fibroids found 1 cancer of the cervix and 6 cancers of the body of the uterus. Kelly and Cullen found adenocarcinoma in 1·7 per cent of cases of fibroids, and Ellice MacDonald in 2·9 per cent. The low relative proportion of cervical cancers becomes much more striking when it is borne in mind that these are about sixteen times more common than body cancers. Taking all fibroids, even the smallest, into consideration, the proportion of cases of cervical cancer in which these tumours



FIG. 267.—Marked increase in number, size, and complexity of cervical glands in a cervical polypoid thickening from a case of nodular solid alveolar cancer of the cervix. The change here shown is simple and presumably due to irritation. ($\times 80$.)

are found is probably less than 5 per cent, whereas in body cancer the proportion is nearly 30 per cent. A partial explanation of the difference may possibly be found in the higher average age of the patients affected by cancer of the body. Where the fibroid forms a large tumour the complication is serious, as the cancer is usually far extended before it is discovered, and the diagnosis of operability is very difficult.

Adenomyoma.—In my series adenomyoma has been found to coexist in 3 cases of cancer of the cervix, 2 of them alveolar and 1 glandular. In 2 of the cases, the adenomyomatous tissue was diffusely scattered through the muscular wall of the body, and had originated apparently in connection with the endometrium.

¹ Munro Kerr, *British Medical Journal*, 1910, vol. i. p. 68.

In the third case the adenomyoma formed a polypoid projection into the cavity of the uterus, which contained clear mucinous fluid. There was no sign of malignancy in the adenomyomatous tissue of any of the cases, nor was there any suggestion of direct connection with the cervical cancer.

Tubercle.—Very rarely tubercle of the uterus has been found to coexist with carcinoma. Two such cases are related by Wallart,¹ and another by d'Halluin and Delval.²

Prolapse.—In only 3 of my cases has cervical cancer arisen in a prolapsed uterus. Passive congestion and oedema, and fibrous overgrowth, do not appear to favour the origin of cancer; neither does there seem to be any causal relation between the so-called pressure sores met with in neglected prolapse and the origin of cancer. Russell Andrews³ has related a case in a single woman of 86 with a contact cancer of the right labium. In one of my cases, cancer arose on the cervix of a woman who had long worn a very offensive rubber ring pessary. Morestin⁴ relates a similar case in which a firm bleeding cancer of the posterior lip of the cervix fitted into the aperture of an old red rubber pessary that had been neglected for years. Other similar cases have been published from time to time, but not in sufficient number to suggest anything other than a casual relation.

Inflammation of the Ovaries and Fallopian Tubes.—Chronic inflammatory diseases of the appendages, especially in the form of catarrhal salpingitis, and less commonly of pyosalpinx, are not very common in cancer of the cervix. Occasionally small ovarian cysts, often inflammatory in origin, are present. Not rarely the affection of the appendages is tuberculous, and occasionally old tuberculous glands are also present. In nearly every case the inflammatory affection is obviously much older than the carcinoma, and although sometimes, especially in pyosalpinx and in old atrophic salpingitis, the disease may greatly increase the difficulty of the radical operation for cancer, there seems little ground for believing that cervical cancer is a serious or frequent cause of septic inflammation of the Fallopian tubes or ovaries.

Tubal gestation has occasionally been present, but there appears no reason to think that its coexistence with cervical cancer is other than casual. Such a coincidence was present in one of my cases, and in others published by Lewers,⁵ Freund,⁶

¹ *Zeitschr. für Geburtshilfe und Gynäkologie*, Bd. I. H. ii. p. 243.

² *Bull. et Mém. de la Soc. Anat. de Paris*, July 1910.

³ Russell Andrews, *Proc. Royal Society of Medicine (Section of Obstetrics and Gynaecology)*, March 10, 1910.

⁴ Morestin, *Bull. et Mém. de la Soc. Anat. de Paris*, March 1900.

⁵ Lewers, "Tubal Mole complicating Carcinoma of the Cervix," *Obstetrical Transactions*, 1903, vol. xlv. p. 335.

⁶ Freund, mentioned in *Veit's Handbuch der Gynäkologie*, Bd. iii. H. ii. p. 357.

and Wertheim.¹ My case occurred in a woman of 38 with well-marked signs of congenital syphilis; she had had seven children and seven miscarriages. A cauliflower growth from the posterior lip of the cervix proved to be squamous epithelioma. There was a history of a seven weeks' miscarriage a month before operation, aching in the pelvis, and swelling in the lower abdomen; bleeding had been continuous for seven weeks. Vaginal hysterectomy was done; the right tube had been pregnant and was removed together with a large haematocele and a mole that showed well-preserved chorionic villi, and tracts of decidual tissue. The patient remains well fourteen years after the operation.

General Diseases.—As regards the presence of general complications, the old opinion that there is a certain antagonism between grave diseases, that, for example, a phthisical patient, or one with serious heart disease, is rarely attacked by cancer, cannot be entertained. I have seen cervical cancer arise in a V-para of 29 who had been in bed for two years with general and severe rheumatoid inflammation and ankylosis in all her joints, and who suffered from extreme anaemia. In several cases the patients have been enormously fat, and in two the obesity was complicated by glycosuria. Valvular heart disease, pulmonary tubercle, goitre, simple and exophthalmic, also occurred in my series, and these various other complications are far from rare.

Syphilis.—The relation of uterine cancer to syphilis still remains to be worked out with the aid of the newer methods of diagnosis. A history of syphilis acquired many years previously was given in several of my cases, although a systematic investigation on the point has not been undertaken. In two others, including the patient with tubal gestation, the stigmata of congenital syphilis were well-marked and unmistakable.

Pyometra

Retention of fluid in the cavity of the body of the uterus occurs in a certain proportion of cancers of the cervix. In one of my cases in which symptoms had been present for one month and where there was a papillary growth of the posterior lip, there was a small collection of clear serous fluid in the dilated uterine cavity. Sometimes the fluid present is blood, or at least there is a considerable admixture of blood as in another of my cases. These cases are not uncommon and are usually found in advanced life.²

Far more commonly the fluid is puriform, and this was the case in 12 of my 136

¹ Wertheim, *Archiv für Gynäk.* Bd. lxxv, p. 14, Case 42.

² Stein, *Zentralblatt für Gynäk.* No. 4, 1910.

operation cases (Fig. 268). Walter Tate¹ found pyometra present 3 times in 28 cases; Lewers 2 in 57; and Bürkle in 17 of 273 cases, or 6·2 per cent. The majority of published cases have been in old women long after the menopause, and this is generally supposed to be the rule. Among my 12 cases, however, 1 patient was aged only 31, and in 3 others the menopause had not occurred; 6 were 55 and upwards, the oldest being aged 66.

The fluid present is often offensive, sometimes extremely foetid; in 3 of my



FIG. 268.—Solid alveolar carcinoma infiltrating the whole cervix, with pyometra. Removed by vaginal hysterectomy from a multipara, aged 55, who had complained for three months of losses of blood alternating with offensive, dirty, watery discharge, and of wasting, and right iliac pain. The patient was well and free from recurrence five years later.

cases it was noted distinctly as not offensive. The quantity varies from a few drachms to one pint or more. The fluid resembles pus and has often been described as purulent; on examination by the microscope it frequently turns out not to be composed of pus, but to consist largely of epithelial *débris*. The term puriform is, therefore, to be preferred.

The collection commonly occurs in an organ that has undergone senile atrophy, and the walls of the uterus become stretched and thin in proportion to the amount

¹ Tate, *Trans. Obstet. Soc. London*, vol. xxxix.

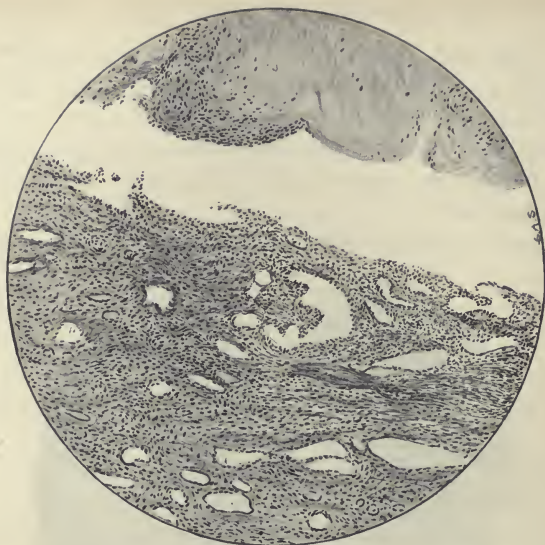


FIG. 269.—Pyometra from IV-para, aged 61. ($\times 132$.)
Endometrium greatly atrophied, catarrhal, and oedematous.

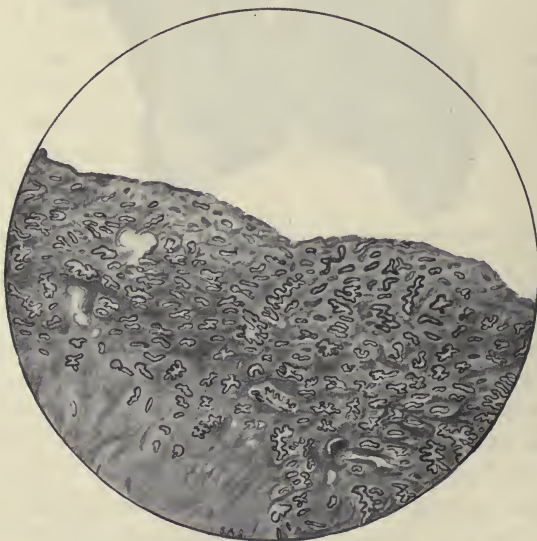


FIG. 270.—Pyometra from VIII-para, aged 45. ($\times 29$.)
Marked glandular hyperplasia, interstitial oedema, and round-celled infiltration.

of distension. The muscular walls are, as a rule, flaccid and yielding, so that the distended organ feels like a rather soft and ill-defined cyst.

The structure of the lining of the distended uterine cavity varies greatly from case to case. In the majority of cases, as might be expected from the age of the patients, the endometrium is markedly atrophic, and the glands are few in number and altered in shape (Fig. 269). Occasionally, marked glandular hyperplasia is observed (Fig. 270). Usually, but by no means always, signs of catarrh and oedema are present in greater or less degree; sometimes small round-celled infiltration is intense

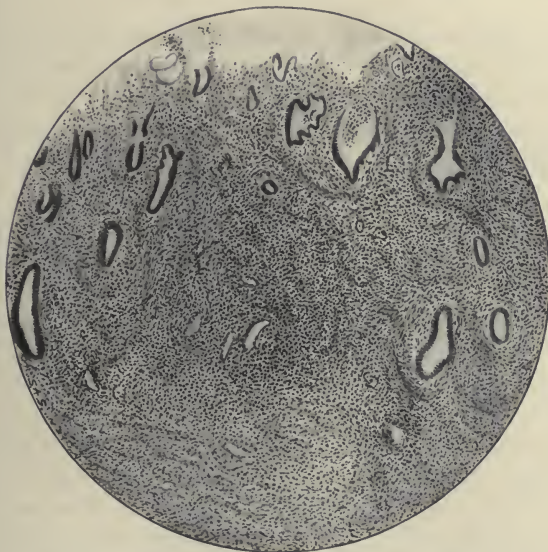


FIG. 271.—Pyometra from IX-para, aged 62. Interstitial endometritis. ($\times 105$)

(Fig. 271). Occasionally a lining of tumour-tissue is found (Fig. 272). In some instances inflammatory conditions are present elsewhere in the genital tract. Thus, in two of my cases there was salpingitis; in one of them the tubes were greatly thickened with purulent contents, and there was also urethritis.

The mechanism of the retention of fluid varies. Commonly a tumour in the canal, together with infiltration and thickening of the walls of the cervix, appears to give rise to organic obstruction to the escape of discharges. Often, however, there is no obvious obstruction, as, for instance, in my youngest case where the cancer formed a small cauliflower mass on the end of the cervix. In these cases the retention depends on the loss of tone and flaccidity of the muscular wall of the

uterus, which appears to be associated in some instances with the condition of senile atrophy.

The form of cervical cancer present is in the great majority of instances a solid alveolar tumour which usually shows keratoid degeneration. This was the variety in all my cases of pyometra of cervical cancer. Eden¹ has reported a case in which the growth was a typical columnar-celled adenocarcinoma of the cervix.

As in uncomplicated cases of cervical cancer, so here, there are no early symptoms. The first complaints are usually of pain or discharge, or both together. In two-

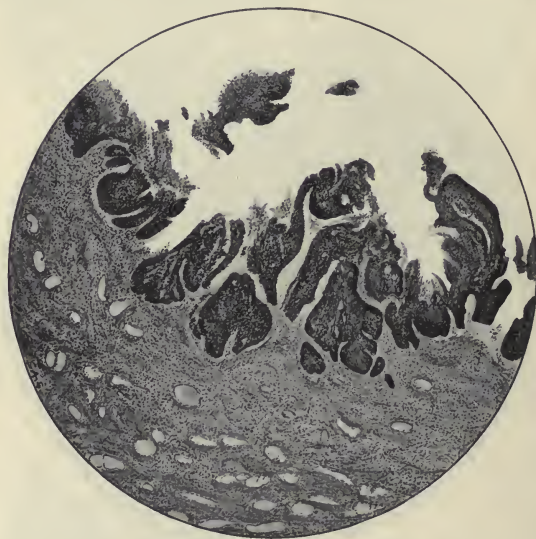


FIG. 272.—Pyometra from III-para, aged 66. ($\times 50$)
Surface lining of solid alveolar cancer with keratoid degeneration.

thirds of my cases, pain either alone or synchronous with the appearance of a discharge was the first symptom. Sometimes pain was entirely absent. When present the pain varied in its seat, being lower abdominal, sub-umbilical, sacral; sometimes round the hips, or in one or other of the iliac fossae. The character was described variously as aching or throbbing, constant or intermittent, or sometimes as bearing down, especially before discharges. In one-third of my cases the complaints began with a sudden bleeding of some severity accompanied by clots, and followed by a continued discharge. In about an equal number the illness began with pain and discharge together. The discharge was often but not always foetid; it varied in

¹ Eden, *Transactions Royal Society of Medicine (Obstetrical and Gynaecological Section)*, Jan. 2, 1913.

consistence in different cases, being usually more or less watery or serous; in colour, it was mostly yellowish or reddish, but sometimes it was dirty white or drab. Commonly, the discharge was more or less blood-stained, or alternated with losses of blood. Sometimes the gushes of offensive puriform fluid escaped at intervals of a few days, with or without preceding pains.

General symptoms are commonly not marked. In two only of my own cases was there notable loss of flesh; one woman weighing 18 stones had had symptoms for nine months, and had not become thinner. There is, at least as a rule, no rise of temperature.

The treatment of cancer complicated by pyometra is governed by the same principles as that of uncomplicated cases. It is impossible to give the operable ratio of such cases, since the proportion of inoperable cervical cancers accompanied by pyometra is unknown. Operation is attended by a greater risk of sepsis, the prevention of which calls for special precautions. The rate of recurrence following operation does not appear to be unusually high. Three of my cases remained free for eight years and upwards after vaginal hysterectomy.

Cervical Cancer in Pregnancy

Cervical cancer is rare in women under the age of thirty, and pregnancy becomes uncommon after forty, so that the coexistence of the two conditions is fortunately far from common. Cancer has been estimated to occur about once in two thousand pregnancies, though some observers have found greater frequency, *e.g.* Glockner¹ in the Leipzig clinic once in 1500 cases. Conception is more likely in the earlier stages of the disease, and soon becomes hindered mechanically, and by chemical and putrefactive changes in the discharges, as well as by those changes in the endometrium that frequently accompany the cervical disease. The frequency of pregnancy in cancer of the cervix has been estimated at from 1 to 2 per cent but is probably higher, inasmuch as account must be taken of all cases coming under observation within a certain period after labour; in many of these, definite symptoms have been present during pregnancy, or have persisted after delivery. In my own experience pregnancy, present or within twelve months, has complicated about 8.7 per cent of the cases of cervical cancer. In the ten years ending with 1913, of 110 radical operations 3 were performed in the last few weeks of pregnancy, and 4 others in women who had been delivered within one year. The operable ratio of the cases observed during pregnancy and within a year after delivery was about

¹ Glockner, *Hegar's Beiträge*, Bd. vi. 2; *Centralblatt für Gynäk.*, 1902, No. 39.

27 per cent, as compared with the general one of 30 per cent—a hardly notable difference.

Conception appears to occur much more readily in cancer affecting the vaginal portion than in that of the cervical canal; Glockner found 11 cases in *portio* cancer and 2 in cancer of the canal.

The patients affected are mostly between thirty and forty, and the average age is, of course, markedly less than that of cervical cancer patients in general. The average number of pregnancies in the 26 cases just referred to was seven, practically the same number as in cervical cancer generally. There appears no reason to suppose that the concurrence of cancer and pregnancy is other than casual.

Opinions differ as to the influence of pregnancy, labour, and the puerperium on the course of the cancer. Among the older writers on the subject, Spiegelberg observed that the disease made no progress but remained constant, and Cohnstein stated that in long-standing cases pregnancy has a relatively favourable effect. Most observers, however, agree that the pregnancy exerts a baneful influence. The enhanced activity of the circulation of blood and lymph, the softening of the tissues, and the increased metabolism, are all shared by the new growth, proliferative activity of which is thereby excited, while, at the same time, the avenues of spread and metastasis become opened up. That the general changes produced by pregnancy exert any influence, favourable or the reverse, on the condition of immunity with respect to cancer, has not so far been suggested.

The local effects on the cervical disease produced by delivery are greater when produced at or near full term. The cancer is crushed, and tearing spreads into the cervix, uterine body, vagina, and connective tissues; the growth of the tumour is thus again excited and its spread facilitated, while, at the same time, septic invasion is likely to lead to ulceration and sloughing. In the puerperium, the conditions of increased local blood- and lymph-circulation favour the rapid spread of cancer into the connective tissue and regional lymphatic glands. When involution is complete, especially if the patient suckles her child, there is reason to believe that the conditions for growth and spread of the cancer become less favourable in proportion to the temporary lactation, atrophy of the uterus and of its supports and appendages. The course of events following conception, however, appears likely on the whole to hasten the progress of the cancer towards the inevitable issue.

Though opinions are divided as to the influence of pregnancy on the march of cancer, there is no doubt as to the terrible effects of cancer on the progress of pregnancy and labour. As has been already noted, conception appears less likely to occur when the disease is already fairly advanced. Abortion is common, the pro-

portion being estimated at from 15 per cent to 40 per cent by different writers. The frequency varies with the stage of the cancer, being more frequent in the advanced stages because of the accompanying endometritis, the repeated haemorrhages, and the exhaustion of the patient's strength. Still, many cases go to full term even when there are very deep destruction of tissue and marked symptoms.

If the whole circumference of the cervix is invaded by cancer, spontaneous delivery is impossible, and unless delivery is effected by operation the woman usually dies of ruptured uterus, bleeding, exhaustion, or septicaemia. Labour is rarely missed, and the foetus retained, as in a case reported by Menzies¹ where the pregnancy lasted seventeen months and the patient died undelivered; the liquor amnii had drained away, and the foetus was compressed, but without signs of maceration. In Playfair's case² the foetus came away piecemeal after a time. Other cases of missed labour have been reported by Miller, Depaul, Beigel, and others.

When delivery takes place, tearing of the uterus may occur. Herman³ collected 180 cases with 72 deaths of mothers, 11 from rupture of the uterus; 13 of the women died undelivered. Sarwey⁴ tabulated 603 cases, including those of Herman; 261 of the women died in, or after, labour. The causes of death included exhaustion due to long and hard labour, bleeding, rupture of uterus, air embolism, and septic and pyaemic complications. The patient died undelivered in 8 per cent of the cases. Placenta praevia is comparatively frequent, due, no doubt, to the accompanying endometritis. The life of the child is in danger to the same degree as that of the mother; many of the pregnancies end in abortion or premature delivery; even at full term half the children are born dead or dying. In Herman's collection 58 children were born alive of 114 deliveries. The cause of foetal death is the prolonged and difficult labour, with excessive retraction or tonic contraction of the uterus; the prognosis is influenced by the type of operation, version and extraction being more fatal than forceps. Haemorrhage, premature separation of the placenta, and malnutrition due to exhaustion and cachexia of the mother add to the foetal risks.

Treatment.—The principles upon which the treatment of pregnancy complicating cancer of the cervix should be based, has been a fertile topic for discussion. Formerly one set of authorities reasoned that the fate of the mother was inevitable, and that efforts should, therefore, be directed to procuring the birth of a living child. In opposition to this line of treatment the earliest possible induction of abortion or

¹ Menzies, "Missed Labour in Carcinoma," *Glasgow Med. Journal*, July 1843, p. 229; cf. *Monatsschrift f. Geburts.*, 1855, v. S. 207.

² Playfair, *Trans. Obstet. Soc. Lond.* vol. x. p. 58; Beigel, *Lehrbuch der Frauenkrankh.* p. 522; Miller, *Simpson's Obstet. Works*, 1867, p. 498.

³ Herman, *Trans. Obstet. Soc. Lond.*, 1879, vol. xx. p. 191.

⁴ Sarwey, *Veil's Handbuch der Geburtshilfe*, 1899, Bd. iii. H. ii. S. 489.

premature labour was recommended, especially by Lee and Seanzoni ; this course, however, stood condemned, because while spoiling the chance of the child it offered no distinct advantage to the mother.

Caesarean section, first recommended by Oldham, was practised by some operators on the ground that it saved the child's life and was better for the mother than forceps delivery through the vagina. Herman first drew a clear distinction



FIG. 273.—Cancer of the cervix at the fourth month of pregnancy removed by vaginal hysterectomy from a patient, aged 40, whose seventh child was born twenty-two months previously. The foetus, measuring $6\frac{1}{4}$ inches in length, was first removed after splitting the posterior lip. The placenta is attached to the lower part of the anterior wall. There is a large cancerous nodule in the anterior lip of the cervix.

between the treatment of operable and inoperable cases, and since then the radical treatment of operable cervical cancer coexisting with pregnancy has been undergoing a gradual development, on the same lines as that of cases of the disease apart from pregnancy. Along with this modern surgical evolution the prognosis has become enormously improved ; in 1873 Cohnstein's collected cases showed a maternal mortality of 57·1 per cent ; in cases collected between 1873 and 1893 Theilhaber ¹

¹ Theilhaber, *Archiv für Gynäkologie*, 1894, Bd. xlvii.

found the mortality diminished to 31·5 per cent ; of 88 cases of operation in the first weeks after delivery, collected by Sarwey, only 10·2 per cent of mothers died.

The first real advance in the surgery of the complication was made when it was discovered that the removal of most of the growth, and the use of the actual cautery, diminished the risks of bleeding and infection during delivery ; next followed the removal of the cancer by supravaginal amputation of the cervix, carried out on regular lines in suitable cases. Then vaginal hysterectomy became relatively safe and was applied to cases in the early months of pregnancy (Fig. 273). Of late years the immediate mortality of abdominal hysterectomy has become reduced within reasonable limits, and this operation has become the method of choice with many operators, even in the early months of pregnancy.

The interests of the foetus have to be taken into consideration in deciding the question of the best treatment. In pregnancy occurring in a case of advanced cervical cancer, when the disease is already beyond the reach of radical operation, every means should be employed to safeguard the pregnancy until full term, and then the method of delivery should be chosen which is likely best to serve the interests of the child, while, at the same time, doing the smallest possible injury to the mother. During the pregnancy, pain and other symptoms as they arise require to be treated by the usual means ; pain by sedatives or diffusible stimulants ; haemorrhage by hot douches, by applications of iodine to the bleeding surfaces, or even by curetting and cautery if necessary. The best method of delivery in the present state of practical knowledge is by abdominal section in carefully chosen surroundings (Figs. 274 and 275). It is probably better to choose a time near full term and to make all arrangements deliberately, rather than to wait for the onset of labour. The first step in the operation should be the careful cleansing of the cervical growth with the help of the sharp spoon and cautery. After the delivery of the child by Caesarean section, the question of removal, or preservation, of the body of the uterus remains for decision ; if removal is decided upon it is not always possible to secure a healthy stump, and proliferation into the peritoneum, or into the abdominal incision, is likely to occur later. If the body is preserved, it is important to make sure that there is an outlet for the lochial discharge, and to use copious antiseptic douches during the puerperium. Further experience is necessary to decide which of the two proceedings is the better.

In operable cases the immediate removal of the cancer, without regard to the life of the foetus, offers a reasonable chance of permanent cure for the mother ; she, as a rule, has already a young family urgently requiring her care, while the chance of survival of the foetus at the best is very problematical. Operation should

therefore be undertaken at the earliest possible date, and the method chosen should



FIG. 274.—Median section of advanced solid alveolar cancer of cervix complicating pregnancy. The patient died after conservative Caesarean section at full term. The growth involved chiefly the anterior wall, and extended along the vagina, invading the floor of the bladder as far as the vaginal ostium. There was secondary involvement of the iliac and upper femoral glands. Numerous metastases were present in the liver and over the surfaces of the lungs, and one penetrated the right bronchus.

be that which gives the best chance of freedom from recurrence. Success has been attained by various operations. By the high amputation of the cervix

during the puerperium permanent cures were obtained in three cases by Spencer,¹ who ascribes his success largely to the use of the cautery in performing the operation.



FIG. 275.—Left lateral view of the same case. The ureter is involved in the growth and is greatly distended (U). A portion of the rectum lies on the growth, but is not invaded (R).

At the present time the general consensus of opinion is that it is best to remove the whole uterus, by either the vaginal or the abdominal route. In the last months, it is generally agreed that the abdominal method is better; until the middle of

¹ Spencer, *Trans. Obstet. Soc. Lond.*, 1904.

pregnancy vaginal hysterectomy can be performed, the membranes being ruptured and the foetus extracted after division of the cervix as the first step in the operation. The attachments of the uterus are softened and dilatable in consequence of the pregnancy, so that the operation is, as a rule, surprisingly easy. In my own practice I have twice performed vaginal Caesarean section for cancer complicating pregnancy at the end of the eighth month;¹ the children were extracted alive and the mothers made good immediate recoveries.

Near full term the extended abdominal operation in suitable cases is also easy by reason of the softening of the tissues, and the ureters can be easily dissected out. Infection by septic germs or by cancer-cells can be guarded against equally well in operating by either route, and in each case the use of the actual cautery for the division of the vagina is advantageous. The future will lie with the method of operation that shows the best permanent results; the experience of any single operator is too limited to enable a sound opinion to be formed with confidence. I have operated three times in the last month of pregnancy, twice by vaginal Caesarean section, as above mentioned, and once by the extended abdominal method; all the patients made good recoveries, and all the children were born alive, but every mother had an advanced recurrence by the end of the first year following operation. At the time of Spencer's paper he had been able to find only two other cases in which the patients operated on for cancer complicating labour in advanced pregnancy had remained well more than five years. Since then many more cases have been recorded. Wertheim, in his first 500 cases of extended abdominal hysterectomy for cancer, had 8 complicating pregnancy, including one of tubal abortion; 5 of the patients were alive and free from recurrence after five years. Of the older statistics Hense² made out that a five years' cure occurred in 24 per cent of radical operations performed during pregnancy and the puerperium, as against the general rate of 30 per cent. The immediate results of both vaginal and abdominal methods of operation are reasonably good and are improving from year to year. It is necessary still to work for better remote results, and these we may hope to attain by the earliest possible diagnosis followed by immediate radical operation.

First Symptoms of Cervical Cancer

There are no early symptoms of cancer of the uterine cervix. When the first indication of something wrong is experienced by the patient, the disease is usually

¹ Thomas Wilson, *Brit. Med. Journal*, 1905, vol. ii. p. 706.

² Hense, *Zeitschrift für Geburts. und Gynäk.*, 1901, Bd. xlv. H. i.

found already to have formed a considerable tumour or to have extended far into the substance of the organ; and very frequently the first symptom is of some pathological accident, such as infection, necrosis, or ulceration of the new growth. Not uncommonly it appears that an increase in nutrition and general well-being is the first effect of the disease, and masks its insidious onset. Advanced cases are frequently encountered where the most careful cross-examination fails to elicit a history extending back for more than a few weeks, and such cases are met with in intelligent and fairly observant women. It is, therefore, not always to be imputed as a fault to the patient or to her advisers that the diagnosis of cancer of the cervix is not made until it has passed the operable stage.

On the other hand, symptoms have sometimes been present for a long time in women who are found to have small and limited lesions. Thus in 10 early cases of cervical cancer, symptoms had been present for periods varying from two weeks up to twelve months.

In the great majority of cases application for medical advice is not made until many weeks or months have passed after the appearance of suspicious symptoms. Thus of my cases from 1904 to 1913 more than 57 per cent, that is to say nearly three out of every five, first applied when symptoms had already been present for six months and upwards; while of the cases submitted to radical operation only about one in every five was seen within two months of the onset of the symptoms.

CARCINOMA OF CERVIX, 1904-1913

Time that elapsed between onset of first symptom and application for advice.	Operative Cases.	Inoperable Cases.	Total.
2 weeks to 2 months . . .	19=20·4 per cent	37=16·05 per cent	56=17·3 per cent
3 to 5 months . . .	24=25·8 "	57=24·7 "	81=25 "
6 to 11 months . . .	23=24·7 "	66=28·6 "	89=27·4 "
1 year and upwards . . .	27=29·0 "	70=30·3 "	97=29·9 "
	93 cases	230 cases	323 cases

The reasons given for delay in seeking advice are many. A few women are apparently deterred by their dislike of undergoing an examination; more, apparently, by the fear of being told they have the dreaded disease; but by far the greatest number put off their coming because of the widespread superstition that irregular bleedings are to be expected at the climacteric, and that cancer cannot develop without pain. The early bleedings of cancer are put down to the menopause or to piles, an opinion readily confirmed by the friendly old neighbour or ignorant nurse

called in to consultation. And so competent advice is sought only after the patient's general strength has begun to fail and the cancer has reached a hopeless stage. By far the most common reason for delay is the widespread ignorance that prevails about the early symptoms of the disease, an ignorance we can only hope to dispel by first making ourselves thoroughly acquainted with the symptoms and then by impressing upon women generally, both directly and through the medium of trained nurses and midwives, the necessity for seeking competent advice immediately upon the occurrence of any suspicious symptom.

The first symptom noted in 328 cases of cervical cancer was, in about 40 per cent, bleeding or bloody discharge; in a further 20 per cent bleeding began at the same time as other discharges or pain; in nearly one-third of the cases pain was an early symptom, generally associated with increased loss of blood, or the appearance of a new discharge; pain alone as the first complaint was observed in only about 13 per cent of the cases.

CARCINOMA OF CERVIX, 1904-1913

First Symptom noted in 328 cases—

Haemorrhage	138	} = 213
Haemorrhage with pain	43	
Haemorrhage with discharge	32	
Other discharges	42	
Other discharges with pain	20	
Pain	42	
Other symptoms	11	
	<hr/> 328	

The most common order in which the symptoms develop in a case of cervical cancer are first bleeding, next other discharges, and finally pain and general cachexia.

Bleeding in the early stages of the disease may come from the endometrium and occasionally occurs as an increase in the regular monthly flow. Much more commonly the loss is irregular from the first, though it is often ascribed to increased duration and frequency of the menses. As a rule the amount is moderate until the disease is advanced, and when the loss is described as 'flooding' and accompanied by clots, ulceration or sloughing of the cancer has begun. The bleeding often follows upon injury or traumatism, such for instance as straining during defaecation, or other severe exertion, or occurs as a consequence of sexual intercourse.

Bleeding or bloody discharge beginning after the menopause, after an interval of two or three months, or after many years, is very suggestive. Of 139 women of fifty years of age and upwards who consulted me for bleeding, 128 were married, and of these 53, or 41.4 per cent, were affected by cancer of the uterus or of the vagina. The other 11 were single, and of them 7, equal to 63 per cent, had cancer

of the uterus—of the cervix in one case, and of the body of the organ in the other six. The complaint of bleeding in a woman over fifty, particularly in a single woman, and especially if bleeding recommences after the menopause, is so suspicious as to lay on the medical adviser the onus of proving the absence of cancer.

In many instances, especially of the harder scirrhus forms of the disease, little or no bleeding occurs in the early and even in the later stages.

Frequently associated with increased loss of blood, constant discharge makes its appearance, profuse and watery, or less in amount and whitish or yellowish in colour; the two symptoms, bleeding and discharge, may begin together, especially where the cancer forms cauliflower growths. When pain begins along with the early haemorrhages, septic infection leading to inflammation and ulceration of the growth is often the explanation.

In about one-fifth of the cases discharge, with or without pain, is the first symptom noted and not infrequently the discharge remains for a long time the only complaint. Especially in cauliflower growths the discharge may be very profuse and of thin watery consistence made up of serum mixed with mucus. As the disease progresses the character of the discharge alters; it may be mixed with flakes and shreds of opaque grey or white colour, or may be puriform from the admixture of large amounts of cast-off epithelium. Often the discharge is purulent, yellowish, yellowish-white, or yellowish-grey in colour; still more commonly it is mixed with more or less blood, the thin profuse discharge becoming tinged with red and resembling meat-juice, and the thicker discharges becoming more or less dark-red or brown in colour. In the final stages the discharge is usually profuse and consists of a dark, dirty-looking fluid in which float shreds and flakes of slough. The smell of the discharges is in the early stages stale and insipid and not characteristic; then it becomes offensive from the action of putrefactive bacteria; and finally it acquires a penetrating and disgusting stink that is only occasionally equalled by putrid incomplete abortions, neglected pessaries and other vaginal foreign bodies, and sloughing fibroid polypi. This horrible putridity is apt to begin earlier when the disease starts on the vaginal aspect of the cervix than when it originates in the cervical canal, and is acquired latest in cancer of the body.

Pain, unfortunately from the point of view of early diagnosis, does not occur in the earlier stages of uterine cancer. Occasionally it is the first or one of the first symptoms, but even then the disease is usually advanced and the first stages have been passed through without symptoms. Vague discomfort in the pelvis, aching and heaviness, especially after standing or exercise, are first noticed. Commonly there is no distinct complaint of pain until irregular bleeding has been present for

several months, and until the disease has extended far beyond the uterus and become inoperable.

In the early stages there is sometimes increased frequency of micturition, especially in the day-time; less commonly rectal irritation is a complaint. Rarely vulval itching and discomfort, due to irritating discharge, is the first symptom that forces itself on the patient's attention.



FIG. 276.—Cancer of the anterior lip of the cervix. Vaginal hysterectomy. Death from cancer of the liver six years and four months later. A granular prominent swelling projects from the end of the anterior lip of the cervix, forming the free end of a considerable oval tumour, which has infiltrated the anterior wall nearly as high as the level of the isthmus; the growth is practically confined to the anterior wall, but is just beginning to spread into one side of the posterior wall, the rest of which has been thinned and expanded over the tumour.

In the early stages the patient's general condition suffers little or not at all. Occasionally a vague loss of energy or lassitude without obvious cause may be experienced; or the appetite and sleep deteriorate. Sometimes a certain degree of loss of flesh, or a notable diminution of strength, may be noted. If these are present with good appetite and digestion, the presence of organic disease somewhere is to be suspected. But as a rule in the first stages of uterine cancer, and frequently until

the disease is far advanced, no difference is to be observed in nutrition, activity, or feeling of well-being.

Physical Signs

Once cervical cancer has begun to grow its extension may take place over and along the surface, as is common in cancers of the body of the uterus; or the direction



FIG. 277.—The finely granular surface of an extensive ulcer is seen on the everted and hypertrophied anterior lip of the cervix. The whole thickness of the wall is replaced by new growth, which extends as high as the isthmus. The posterior wall appears smooth on the surface and natural, but nevertheless it has also been completely infiltrated. Considerable extension had taken place into both broad ligaments. The specimen was removed by vaginal hysterectomy by the cautery-method from a very fat patient.

of the growth may be principally centripetal, rising above the surface—*exophytic*; or centrifugal, penetrating into the thickness of the wall—*endophytic*. Commonly,

growth extends to a varying extent in all three directions. The gross forms in which cervical cancer is met with clinically are very various. Speaking generally, it is encountered in the form of a *tumour* or of an *ulcer*, or of a combination of the two, a *tumour that has ulcerated*. Much less commonly, in its early stages, it occurs as a mass in the thickness of one or other wall of the cervix—the so-called ‘central nodule.’ In these cases the nodule is always found to be connected with the surface at one part, and this almost certainly represents the seat of primary origin, so that, in every

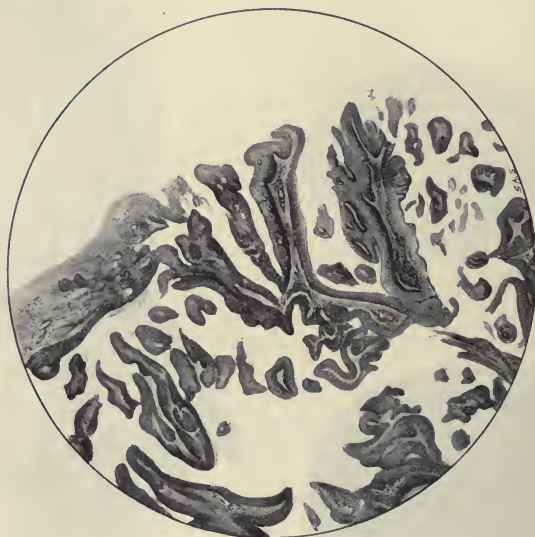


FIG. 278.—Papillary surface of a solid alveolar cancer of the cervix, showing well-developed stratified squamous epithelium. ($\times 29$.)

case, cervical cancer originates in immediate association with either surface epithelium or glandular epithelium.

More or less prominent exophytic growths are found in nearly one-third (31 in 100 of my patients) of the cases of operable cervical cancer that apply for treatment (Fig. 276). The exophytic form sometimes presents as a broad, flat, slightly-raised plaque; but much more commonly as a more or less considerable excrescence, lobulated and polypoid, projecting from some part of the cervix. Sometimes a broad attachment with overhanging margins gives the tumour the form of a mushroom. In the great majority of cases, the external os is involved to a greater or less extent. The surface of the growth is usually papillary or granular. The consistence varies,

but is commonly more or less firm and at the same time friable, easily breaking down under the touch, and readily bleeding. The colour of the surface is red, or yellowish-red, especially in smaller growths. In larger tumours, when pieces are detached, the surface is often yellowish-white and opaque; older tumours are often covered to a greater or less extent by dark-brown, greyish, or greenish sloughs. In some



FIG. 279.—The right upper half of the anterior lip of the external os has been destroyed by ulceration of a tumour that surrounds the lower part of the cervical canal and infiltrates the anterior wall, as a nodular mass, to the level of the isthmus. The right broad ligament was invaded. There is marked polypoid thickening of the endometrium and of the cervical mucous membrane. Small interstitial fibromyomata are divided in the fundus and in the anterior wall. The cancer probably originated in the lower part of the right anterior wall of the cervical canal.

uncommon cases the tumour is firm, the surface is not readily friable, and pressure causes the exudation of greyish-white or yellow puriform fluid at scattered points.

In about two-thirds (69 in 100) of the cases of operable cervical cancer ulceration is the principal lesion present (Fig. 277). In the early stage the ulcer is most commonly in the neighbourhood of the external os, but it may be found on any part of

the surface of the vaginal cervix, or of the cervical canal. The border of the ulcer is usually somewhat raised, irregular, and firm; the floor is depressed, with an uneven surface of greyish colour with hard and yellow patches, and sometimes with soft, papillary elevations of growth resembling granulations (Fig. 278). The base of the ulcer is hard from infiltration of the new growth to a greater or less depth.

When the disease begins in the cervical canal the external os is usually patulous



FIG. 280.—Nodular cancer of supravaginal cervix. The whole uterus, and especially the cervix, is enlarged and thickened. The mucous membrane in the lower part of the cervix is not ulcerated; in the upper part is a large cavity in the anterior wall, from which a mass of new growth has sloughed out; the section shows a large nodular mass of new growth on the opposite wall. The endometrium and the remains of the cervical mucous membrane show polypoid thickenings. The cancer was of the large alveolar type.

and irregular in shape, and just within it a friable papillary growth can be made out. The os in whole or part of its circumference may form a hard irregular ridge, representing the lower part of a more or less considerable ulcer in the cervical canal (Fig. 279). Thus, on superficial examination, the changes in the neighbourhood of the os may suggest early cancer of the vaginal portion, whereas closer examination shows expansion in size of the supravaginal cervix, thickening and induration at one or both sides of the cervix extending outward to the pelvic wall, and diminished mobility.

When the disease begins as a central nodule, the cervix feels thick and large, and the increase in size appears to be due to a hard inelastic nodule in the thickness of one wall (Fig. 280). The nodule is generally somewhat irregular in shape; the mucous membrane covering it usually feels hard and fixed to the nodule, and cannot be moved over it.

The nature of the gross lesion, exophytic growth or ulcer, gives no indication of the minute structure of the cancer. Cullen has suggested that in cervical adenocarcinoma the tissue of the tumour is firmer, bleeds less readily on examination, and attains a more advanced stage before breaking down, but these differences are only of degree, and so far as my observation goes, do not help in the diagnosis.

Diagnosis of Cancer of the Cervix

Twenty years ago a diagnosis of cancer was equivalent to a sentence of death; the medical man was able to do little more than partially relieve the sufferings of the patient, and when consulted by women suffering from suspicious symptoms of uterine cancer, he often, therefore, postponed examination. At the present time it is possible to cure permanently at least one-half of the number of cases promptly recognized, and a grave responsibility is laid upon the practitioner, whose duty it is to examine thoroughly every suspicious case. Delay involves the risks of a curable case becoming inoperable, and a patient's life being needlessly thrown away.

The diagnosis of uterine cancer can only be made by physical examination, and this should be done at the earliest possible opportunity. Certain symptoms make the probability very great that malignant disease of the uterus is present. Such are bleeding or blood-stained discharges after the menopause, and bleeding on coitus. But it must never be forgotten that there are no early symptoms, and that as a rule the first complaints arise from some accident to the tumour, such as an injury, ulceration, or sloughing. Only in the early stages of the disease is the outlook for cure good. Delay in the necessary examination is still far too common, and the reason may be found either in the patient or in the practitioner. In the great majority of cases the former is at fault, but in no small number the delay is due to remissness or want of knowledge on the part of the medical practitioner first called in.

The complete diagnosis of uterine cancer has to settle two problems. In the first instance, is uterine cancer present, and if so, is the condition operable? The second question can only be decided finally by the operator, and the indications will vary considerably with the individual surgeon.

I. Diagnosis of the Presence of Cancer in the Early Stages.—The method of

making this part of the diagnosis depends on the situation of the disease. On the surface of the cervix or in the lower part of the canal, the lesion is accessible to touch and sight; in the upper part of the cervix with closed external os, it is inaccessible. In the latter cases the diagnosis depends on the same principles as that of cancer of the body—on the recognition of enlargement or hardness by digital and bi-manual examination, examination by the sound, and above all on examination by the finger or curette after dilatation of the cervix, and on microscopic examination of the curettings (cf. *Diagnosis of Corporeal Cancer*, p. 529).

In accessible lesions the chief part of the desired information is acquired by digital and bi-manual examination, and by the use of the sound and the curette. Abdominal examination usually discloses no abnormal physical sign. The vulva appears natural as a rule, but occasionally, even in a comparatively early cervical cancer, there may be irritation and excoriation of the skin, with complaints of itching and discomfort.

Digital examination by the vagina usually shows the presence of some enlargement of the cervix; this may take the form of a prominent outgrowth extending above the general level of the surface, of a swelling in one wall displacing the external os towards the other side, or of a general thickening of the whole cervix. The prominent proliferating growth may be attached to one or both lips or to the whole extremity of the cervix by a broad base, or it may be polypoid, the attachment narrower than its greatest diameter.

The lesion present is very frequently an ulcer with base depressed below the general level of the cervix. Such an ulcer may be found at any part of the outer surface of the vaginal cervix or of the cervical canal; in the latter situation, when the external os is closed, an ulcer of even considerable size is easily overlooked (Fig. 281). In the majority of cases the os is involved, more or less, in the destructive process. Very commonly, the whole or part of the margin of the external os feels hard, irregular, and nodular, forming the edge of an ulcer that appears to be small, but that is, in reality, merely the lower end of a large and advanced lesion affecting the whole cervical canal and cervix.

Sometimes a considerable growth takes place in one lip of the cervix, and after a time sloughing occurs in its middle, and a crater-like depression is formed that may be mistaken for the cervical canal surrounded by cancerous growth.

Digital examination then takes note of the two leading characteristics of cancer—the formation of a tumour and ulceration. The important part of the new growth does not form prominences, but invades the cervical walls, forming a hard base, of greater or less thickness, to the ulcers, and a similar hard attachment to the pro-

minent outgrowths. The induration of the tissues is, as a rule, marked; the affected portion of the cervix loses its resilience and becomes hard and inelastic, often board-like. In addition to the ulceration and hardness of the growth there is another sign of great diagnostic significance, almost, indeed, pathognomonic: the newly-formed tissue is friable; that is to say, it breaks down under pressure—greater or smaller portions of tissue visible to the naked eye becoming detached. As a rule this physical

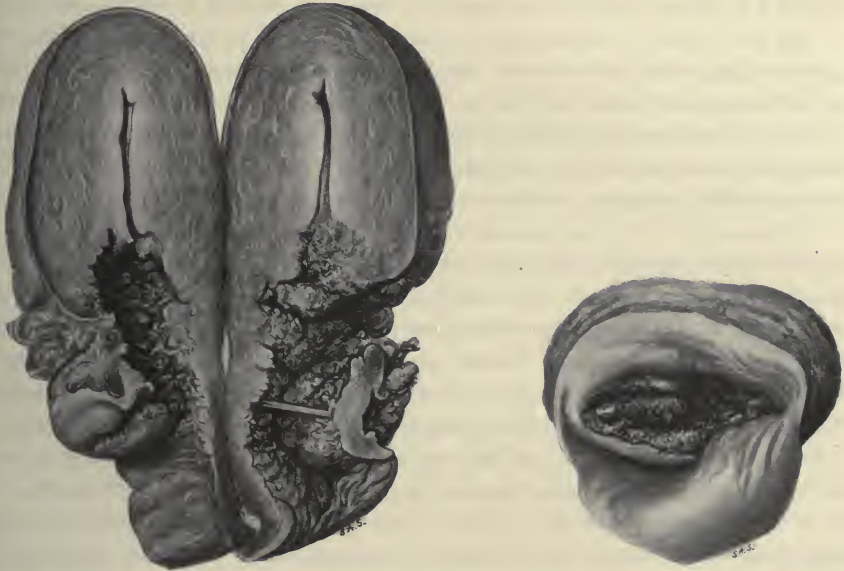


FIG. 281.—Cancer beginning in the supravaginal cervix and spreading upwards into the body and downwards into the vagina. The external os forms the margin of a granular ulcer which has destroyed nearly the whole of the cervix and has extended posteriorly for about one centimetre on to the vaginal wall. Antero-posterior section shows that the ulcerating new growth has extended upwards above the level of the internal os while part of the vaginal portion is preserved. The tumour was solid alveolar cancer with numerous 'epithelial pearls.'

sign is easily elicited, moderate pressure by the examining finger being all that is necessary. It can be tested by the use of the sound which sinks into the friable tissue, or by the curette which brings away distinct masses; as the tissue breaks down, bleeding follows. Bleeding on careful and gentle examination of the uterus is always suspicious; it occurs frequently in other conditions, but its occurrence demands a careful investigation with the possibility of cancer borne in mind. Friability is a characteristic of other malignant tumours of the uterus, of sloughing fibroid tumours and polypi, of tuberculous lesions, and of products of conception

retained in the uterus, but in most of these cases the diagnosis becomes obvious by attention to the other physical signs.

By bi-manual examination the extent and distribution, shape and hardness, of the cervical tumour is investigated and special attention must be paid to any alteration in the supravaginal cervix and in the surrounding connective tissue, and to the mobility or fixity of the uterus.

The speculum shows the surface of the cancerous tumour or ulcer to be more or less dark-bluish in colour, often covered wholly or in part by grey, yellow, or green sloughs. The colour differs notably from that of the normal cervix, as can be well seen in early localized lesions. The border of an ulcer at the external os is usually characteristically raised, jagged, and irregular, with a yellowish dirty line along its inner margin. In nodular cancer the mucous membrane covering the surface usually presents a bluish or mottled appearance.

The sound is of limited use, and requires to be employed cautiously. Its chief value is in the estimation of the friability of any suspicious-looking tissue.

In any case of difficulty or doubt, immediate recourse should be had to microscopic examination of a portion of tissue removed for the purpose. The local application of cocaine suffices, and it is often not necessary to give a general anaesthetic. The vulva and vagina should be well cleansed with soap and water followed by the thorough use of a reliable antiseptic solution. The patient is placed in Sims' position, a duckbill speculum is passed, and the cervix seized with a volsella. A wedge-shaped piece of tissue is then excised, with the base about half an inch in width, so placed as to include a portion of the suspicious tissue with about an equal amount of the adjacent healthy-looking cervix. The wedge should extend about half an inch into the cervix. Bleeding is easily controlled by one or two catgut stitches so placed with a full-curved needle as to bring into apposition the two raw surfaces left by the excision of the wedge. A strip of iodoform gauze is introduced into the vagina, and the patient kept in bed for the next twenty-four hours.

Examination of sections of the wedge of tissue thus removed, will enable the practised pathologist to give a definite opinion as to the nature, malignant or simple, of any suspected tissue. The necessity for this method of examination diminishes with increasing experience, but when the least doubt remains after the ordinary objective examination, there should be no hesitation about its employment, because delay in diagnosis may entail the sacrifice of the patient's life.

Differential Diagnosis.—The affections of the vaginal cervix that have to be considered in making the diagnosis of cancer include follicular hypertrophy and the general enlargement and induration not uncommonly found in chronic metritis,

especially when associated with large lacerations and eversions. Cicatricial contractions of the upper part of the vagina and neighbourhood of the cervix may give rise to doubt. Warty growths have no hard base and are practically never seen unaccompanied by warts on the vagina or vulva. Fibroids of the cervix, sessile or pedunculated, may cause difficulty, especially when sloughing. Mucous polypi call for careful examination, inasmuch as they may sometimes be the seat of malignant disease (Fig. 249), or may be present along with a cancer at a higher level in the uterine cavity.

Ulcers and conditions resembling ulcers of the cervix include *erosion* and eversion, pressure sores from prolapse or from pessaries or other foreign bodies, and membranous ulcers, such as occur in puerperal infections and sometimes follow the application of caustics. Tuberculous affections of the cervix are occasionally met with and require the help of the microscope in diagnosis. Syphilitic affections and soft sores are rare in this situation.

II. Diagnosis of Operability.—This varies with the individual surgeon, but generally speaking, radical removal of the disease may be undertaken when there appears to be a reasonable chance of making the necessary incisions outside the limits of the new growth. In attempting to estimate these chances there are many fallacies; the growth may have permeated the lymphatics for many inches without altering the physical characters of surrounding tissues, and on the other hand the pelvic connective tissue, peritoneum, or uterine adnexa may be hardened and thickened by old or recent inflammatory changes, suggesting a wide extension of the cervical cancer.

Digital examination by the vagina and especially by the rectum, supplemented by bi-manual examination, enables an investigation to be made of the amount of thickening and enlargement of the cervix as well as the condition of the surrounding tissues. If there is a zone of yielding, unaltered tissue all round the cervix, especially if the bases of the broad ligaments and the uterosacral ligaments are soft and elastic, these tissues are probably free from growth. If there is hardness extending up to the wall of the pelvis on one or both sides of the cervix or behind the isthmus, malignant invasion has probably taken place; the hardness is, however, occasionally due to old inflammation, especially to chronic salpingo-oöphoritis or to pyosalpinx. The general condition of the patient, and the past history, may help to guide us to an opinion of the nature of the induration in such a case.

If on bi-manual examination, or with the volsella, the uterus can be freely moved the case is operable. If mobility is impaired the fallacy just discussed requires consideration.

An attempt to estimate the forward extension may be made by cystoscopy. Spread in this direction is common and may occur early. Pale oedematous patches of vesical mucous membrane are often seen, especially at the lower part of the posterior wall and behind the trigone. These are seen when the wall of the bladder is beginning to be attached to the new growth and before any notable infiltration takes place; their recognition does not, therefore, cause hesitation in undertaking radical operation. When the vesical wall is infiltrated the growth makes its appearance in the same situations as above mentioned, and appears as opaque white or yellowish-white circumscribed nodules, often slightly raised above the surrounding surface. This appearance precludes operation unless the operator is prepared to resect the bladder and probably the lower end of one or both ureters. In other cases the bladder-lining in front of the cervix is pale and wrinkled, an appearance that suggests infiltration of the underlying muscular wall, and consequent care in the separation of the bladder.

In cases that are doubtfully operable, even after the most careful examination, recourse may be had to abdominal section. The first stage of every abdominal hysterectomy for cancer is of course exploratory; the extension of the growth upwards towards the uterine body, forwards towards the bladder, and outwards and backwards in the broad and uterosacral ligaments, the condition of the ureters, and of the uterine appendages, and the presence or absence of enlargement of the lymphatic glands, are all investigated. If the conditions observed appear to preclude radical operation the abdomen can be at once closed. The extended investigation, thus made possible, is attended by comparatively little risk, and may be undertaken with advantage in any doubtful case.

Radical Treatment of Cancer of the Cervix

The consideration of the treatment of uterine cancer may be divided under three headings according to the stage of the disease: in the *earliest* stages the means adopted are radical or curative; in the *middle* stages the aim is not only to alleviate symptoms but to find some means that shall favourably influence the course of the disease, or possibly cure it by destroying its elements or by raising the resistance of the patient's body; in the *terminal* stages of the disease treatment is directed to the relief of suffering and the promotion of euthanasia. The methods that have been employed in the second and third of these stages will be dealt with later; in this place the radical methods alone will be considered.

Hitherto the only tangible and substantial success in the treatment of uterine

cancer has been obtained by the employment of surgical operative methods. Any hope that may be entertained of radical cure by other means should not interfere with the endeavour to secure surgical treatment for the largest possible number of cases at the earliest possible moment. Nothing is more certain than that a considerable proportion of the patients can be permanently relieved of their disease by surgery, and that the proportion is increasing and can be further increased by earlier diagnosis and prompt operation.

The radical operative treatment of cancer of the cervix only will be treated here, that of cancer of the uterine body being considered later.

The scientific foundations of the surgical treatment of cancer rest on a knowledge of the origin and spread of the disease. In its beginning cervical cancer is a local affection in close connection with the mucous membrane covering the vaginal portion or that which lines the canal of the cervix. As it grows the cancer-cells permeate the lymphatics of the muscular and connective-tissue wall of the cervix and spread along them into the surrounding connective tissue. Here the lymphatics are abundant; they communicate freely with those of the upper one-third, or so, of the vagina, and the collecting trunks pass to the iliac glands, which become infected by the cancer at a comparatively early stage in about one-third of the cases. The onset and course in the earliest stages are very variable, and it is impossible to determine, by clinical examination, the exact extent of the disease. In every case it is expedient to perform an operation that shall remove the common avenues of extension, which include the parametria, the upper third of the vagina with its surrounding connective tissue, and the iliac glands.

The pathological foundations of a well-planned operation for cervical cancer, thus briefly enumerated, have been arrived at as the result, not of post-mortem examinations, but chiefly of patient and continued efforts at surgical cure, efforts that have progressively extended their scope and improved their results in the course of the last generation.

In the early 'eighties of the last century an operation that was attended by a small mortality and gave freedom from recurrence for three years was considered a great advance. The diseased cervix was removed by the knife, or, better, by the galvanic *écraseur*; the immediate mortality averaged from 6 to 10 per cent; haematometra was a common sequela, the proportion of cases suitable for the operation was small, and most recurred after a short interval.

The high, or supravaginal, amputation of the cervix followed, the inside of the uterine body being removed and a mere shell of muscular wall left behind. The mortality continued about the same, the operable ratio was probably a little higher,

and the rate of freedom from recurrence better. Lewers¹ in 1902 had performed the operation 33 times, and knew that 6 of the patients remained well for more than five years. Byrne operated with the galvano-cautery and stated that out of 81 patients 35 remained free from recurrence for more than three years.

Vaginal hysterectomy was introduced on the principle that in operating for cancer it was necessary to remove the whole organ in which it originated, and on the more solid ground that in a dozen or more cases it had been observed, that, along with the cervical growth, a second independent one was present in the body of the uterus. Though solemnly denounced at the London Obstetrical Society in 1885, the operation soon afterwards became established as the method of choice, and in 1902 its achievements were summed up by the present writer as follows:² "Among 100 cases of cancer applying for treatment 25 to 33 are suitable for vaginal hysterectomy; the immediate mortality is 5 per cent or less; of 100 cases surviving operation 25 to 33 are well five years afterwards; thus of 100 cases originally presenting themselves for treatment, vaginal hysterectomy makes possible a lasting cure in from 4 to 10 patients." This last proportion gives what has since been called the 'total curability.' In my hands to June 30, 1909, an operability of 18 per cent (52 radical operations in 288 cases), with one death following operation, was obtained, 16 patients surviving after five years. The total curability in my hands was therefore 5.5 per cent.³

Observation has shown that recurrence after vaginal hysterectomy takes place as a rule in the scar or its immediate neighbourhood, and much less commonly in the regional lymphatic glands. The extension of the operation to include the removal of as much as possible of the connective tissue surrounding the cervix has therefore been sought in two directions, by the vaginal and abdominal routes. By the help of a large vagino-perineal incision a wide removal of the connective tissue at the sides of the cervix without injuring the ureters was found possible. By no vaginal operation is it possible to reach the iliac glands, and, therefore, the majority of operators have adopted the abdominal route.

The upholders of the extended vaginal operation urge that in two-thirds of the operable cases the glands are not affected, and that the operation for their removal is always incomplete, is dangerous, and should be abandoned.⁴ De Ott⁵ has given

¹ Lewers, *Cancer of the Uterus*, p. 140. H. K. Lewis, London, 1902.

² Thomas Wilson, *Journ. of Obst. and Gynecology*, 1902, vol. i. p. 525. (Cf. references.)

³ Thomas Wilson, *Surgery, Gynecology, and Obstetrics*, October 1914, pp. 456-461.

⁴ Gellhorn, *American Journ. of Obstet.*, July 1905.

⁵ De Ott, *Proc. XVIIth International Congress of Medicine*, London, 1913: Section viii. *Obstet. and Gyn.* pt. ii. p. 253.

the results of 295 of these operations of five years' standing and upwards. The percentage operability of the first part of these cases was 42·8 per cent, the immediate mortality 1·7 per cent, and the percentage of freedom from recurrence for five years and upwards among those recovering from operation 28·7 per cent.

Schauta,¹ with an operable ratio of 51·3 and an immediate mortality of 8·9 per cent, claimed an absolute curability of 16·6 per cent. In Thorn's cases the operable ratio was 44·2, the immediate mortality 5·2 per cent, and the total curability 19·3 per cent.

In this country Sinclair was the chief exponent of the extended vaginal hysterectomy for cancer, and since his death the operation appears to have fallen into complete disuse. Among my early cases I employed the vagino-perineal incision in a few instances, but on the second occasion in an advanced case of carcinoma of the body an implantation metastasis occurred.

CASE 4. A single woman of 50 began to have irregular periods at 47, and ceased to menstruate at 48; afterwards there was no discharge until about two months before she was seen, complaining of irregular bleeding with frequent clots. There had been pain in the lower abdomen and sacral region for rather more than two months. The patient was florid and fat and had become stouter in the last three years. By vaginal hysterectomy, with the help of a vagino-perineal incision, a uterus of about the size of an adult nulliparous uterus, with a cavity three and a half inches in length, was removed. The whole of the walls of the organ were infiltrated with cancer showing the structure of adenocarcinoma and spheroidal-celled carcinoma; the largest bulk of the growth was in the anterior and right wall, and there was no distinct line of demarcation from the remains of the muscular coat. An implantation-recurrence was observed in the vagino-perineal incision five months later; it formed a nodule separated by soft and apparently healthy tissue, one and a half inches in breadth, from the scar in the vaginal vault.

Concurrently with the improvement of the vaginal operation endeavours were made to re-establish and to extend the scope of the abdominal method. In 1895 Clark and Rumpf dissected the ureters to remove as much as possible of the parametria, and Ries proposed the removal of the lymphatic glands. In 1898 Wertheim began the long series that served to establish the operation and make it known by his name throughout the civilized world. Since then the immediate mortality of the operation has been reduced from 30 to about 10 per cent, and the dangers of injury to ureters and bladder have notably diminished with increasing experience. The operable ratio varies in different places and in the hands of different operators from about 40 to over 60 per cent. The differences depend largely on the stage of the disease at which patients present themselves for treatment, but are also influenced

¹ Schauta, *Monatsschrift für Geb. u. Gyn.*, 1911, Bd. xxxiii. p. 680.

by the indications and limitations accepted by the different operators. The proportion of cases that recover from the operation, and remain free from recurrence for five years, is between 40 and 50 per cent. The absolute curability of cervical cancer, calculated by comparing the number free at the end of five years with the total number of cases originally applying for treatment, varies between 16 to 17 per cent (Bumm, Döderlein) and 25 per cent or thereabouts (Krönig, Franz).

Wertheim's statistics¹ deal with 450 completed cases of five years' duration and upwards. The percentage operability was 46, the primary mortality 19·5 per cent, and the absolute curability 19 per cent, 186 patients remaining free at the end of five years out of 979 cases originally applying for treatment.

In this country Berkeley and Bonney have published three-year statistics dealing with 71 operations in 112 cases applying for treatment, an operable ratio of 63 per cent. The immediate mortality was 22·5 per cent, and 54·9 per cent of those recovering from operation remained free from recurrence at the end of three years, an absolute three years' curability of nearly 26 per cent. My own completed five years' experience ending June 30, 1914, gave an operable ratio of 32·5; among 98 cases there were 32 operations with 9 deaths; 10 of the patients were well at the end of five years, so that the absolute curability was 10·2 per cent, almost double the corresponding figure for the vaginal operation among the patients in my clinic. The immediate mortality of my cases has been markedly reduced of late years; in the six years ending December 31, 1913, there were six deaths in 62 operations, a rate of rather less than 10 per cent. The operable ratio has also shown a marked tendency to increase, the diagnosis being now made earlier and a larger number of patients sent promptly for operation.

Vaginal hysterectomy still has a place in the radical treatment of cervical cancer. In patients with cardiac disease, chronic bronchitis, or a history of previous pneumonia, and in very fat patients, a long operation in the Trendelenberg position is attended by very grave danger. Some operators prefer the vaginal method in all women over sixty; but it is obvious that measurement of age merely by years is fallacious; some women are old at forty and others young at seventy. A fair proportion of my abdominal operations for cancer have been performed in women over sixty. It is sometimes recommended that the vaginal operation should be employed in very early cancer of the *portio*; these cases are rare and in them there is little if any more risk in the abdominal operation.

¹ E. Wertheim, *Die erweiterte abdominale Operation bei Carcinoma Colli Uteri*, 6 Taf. etc., 1911; E. Wertheim und Weibel, *XVIIIth International Congress of Medicine*, London, 1913: *Section of Obstet. and Gyn.* pt. i. p. 97.

Prognosis after Operation.—The results of operations for uterine cancer have continuously improved and may be confidently expected still further so to do when the possibilities of treatment by operation are more fully grasped by the profession at large and by the public. Radical operations can now be performed with a moderate immediate mortality, and the chief interest has been shifted to the consideration of the remote results. It is to be desired that some definite standard for estimating these should be agreed upon, and five years' freedom from recurrence following operation appears convenient for the purpose. It is true that a certain number of cases recur later, sometimes years later, but the number is small, and the adoption of the five years' limit would prevent confusion. The figures of most importance are the total number of cases of cancer applying for treatment, and the total number of patients surviving five years later; the ratio gives the total curability. In uterine cancer this has been increased nearly twofold in the last decade, and with earlier diagnosis, and the surgical methods now at our disposal, an absolute curability may eventually be hoped for of 25 per cent of all cases of cancer of the uterine cervix.

Another figure, inferior in interest but still of some importance, deals with the proportion of successfully operated cases that are known to survive for five years and upwards. No deduction should be made for inability to trace the patients, for deaths in the interval from other causes, nor for any other reason; not because this would be unfair, but because it only leads to confusion when done by different operators in various ways. In my own practice the proportion was 31 per cent of the vaginal, and 43 per cent of the abdominal operations.

Attempts that have been made at differential prognosis of cervical cancer are not very convincing, but call for more extended observations. It has been asserted that in young patients the disease is usually more rapid in its course, and shows a greater tendency to recur after operation, whereas the reverse is the case with old patients. In pregnancy and the puerperium the prognosis is said to be worse than in cases apart from these conditions, but Hense found 10 cases in 44 remaining free from recurrence, a proportion only a little smaller than the average. The outlook in body-cancer is about twice as favourable as in cancer of the cervix. Among the cervical cases an attempt to discriminate between cancers of the vaginal portion and those of the cervical canal is surrounded by fallacies. The prognosis is, generally speaking, better when the disease is localized in the cervix than when it has spread into the surrounding tissues, but the spread is often to be detected only with difficulty and by careful microscopic examination, and an opinion cannot be given with confidence. Those cases that appear to be early often recur speedily, while others remain free from recurrence although the cut surfaces appear to pass close to, or

even through the borders of the growth. When the glands are invaded by cancer the probability of recurrence after operation is said by Wertheim to be increased threefold.

The natural history of the disease presents too many unknown problems to allow of a dogmatic opinion being formed as to the probable results of operation in any individual case. Cases such as the following are by no means uncommon :

CASE 5. M. D., a VII-para, aged 43, whose last child was born three and a half years ago, had a mushroom-shaped growth the size of half a fist growing from the anterior lip of the cervix, and spreading on to the anterior vaginal wall. There had been foul discharge like mixed water and matter for twelve months, and considerable emaciation for six months. Supravaginal amputation of the cervix by knife, scissors, and ligatures was performed, and the patient continued well and free from recurrence ten years later.

Fleischmann¹ reports 3 cases in which incomplete operations for uterine cancer were followed by freedom from recurrence for 12, 11, and 9 years respectively; in each case the diagnosis was confirmed by microscopic examination. Every operator of experience has been surprised by unexpected cures in apparently hopeless cases.

Recurrence.—Recurrence after operation may be found (1) at the site of the original growth, the operation having been incomplete; (2) at a distance from the former site, but within the limits of the raw surface that has been made during the removal of the disease, and due to implantation of cancer-cells during the operation; (3) at any part along the course of the lymphatic vessels leading from the organ to the lymphatic glands, or in the lymphatic glands themselves; and (4) remote metastases may occur from emboli that have been separated from the primary growth and carried by the blood-stream into some of the remote organs or tissues of the body.

After vaginal hysterectomy, the recurrence is commonest in the scar and in the adjacent paravaginal and parametrial connective tissues. Of 58 such recurrences, Winter found that 54 were in this locality, and Hofmeier reported that of 47 operations in which recurrence took place within a year of vaginal hysterectomy, the disease reappeared in the adjacent parametrium in 45 cases.

The recurrences that follow the extended abdominal operation usually occur in the iliac glands, or at least at some distance from the scar in the vaginal roof and close to the side of the pelvis.

When recurrence does occur, it most usually happens in the first twelve months

¹ Fleischmann, *Lancet*, 1908, ii, p. 1489.

following operation, a fact that is no doubt largely explained by the operation having been incomplete either macroscopically or microscopically. Afterwards the return of the disease becomes less common with each succeeding year. Late recurrences, however, are by no means uncommon, and have been reported up to fifteen years after operation. These late cases upset calculations as to the lasting effect of operation, but are not sufficiently common to interfere with the utility of the five years' test.

Local or lymphatic recurrences form the immense majority. In 202 cases Winter found only nine examples of real metastasis. These may arise in any distant part of the body, most commonly in the liver, and may only begin to grow after many years. In one of my cases the patient died of cancer of the liver $6\frac{1}{2}$ years after vaginal hysterectomy for malignant adenoma of the cervix. Such a case appears to be explained by cancerous emboli from the original uterine focus remaining latent for years, and then finding conditions favourable to its growth.

Efforts to improve the Results of Radical Treatment of Uterine Cancer.—

Attempts to obtain greater success in the operative treatment of cancer have been made in three directions: by modifications in the operation itself; by treatment following operation; and by the endeavour to secure earlier cases for operation.

The gradual extension of the operation from the mere removal of the disease by sharp spoon or cautery, to the modern method of abdominal hysterectomy has been followed by gradually improving results as has been already shown.

The use of the cautery to divide the vaginal wall is advocated by Spencer, who believes that it is efficacious in causing death of cancer-cells beyond the line of the incision itself, as well as in preventing the implantation of living cells on the divided surface. X. O. Werder¹ also strongly recommends the cautery and has with its use devised a combined method of vaginal and abdominal hysterectomy. In eight years he had operated on 78 cases with four deaths. His average operability by various methods for fifteen years was 38, and the percentage of absolute cures 16.5 per cent.

The prevention of recurrence following operation has been sought also by employing means, local and general, that have appeared to be useful in the non-surgical treatment of the disease, many of which will be mentioned later. Cancer-cells remain behind which may be, and no doubt often are, killed or absorbed under favourable conditions. Arsenic and other drugs have been given by the mouth or hypodermically and locally; courses of treatment by X-rays or by radium have been prescribed. None of these methods has got beyond the experimental stage,

¹ X. O. Werder, *Surg. Gyn. and Obstet.* vol. xvi. pt. iii. p. 272.

but some of them, perhaps especially the treatment by rays, appear to be deserving of an extended trial. It must never be forgotten, however, that some of these weapons are double-edged, and may have powerful and unexpected results.

Much desultory work has been done with a view to securing earlier diagnosis and treatment. A committee of the British Medical Association prepared appeals to midwives and nurses and medical practitioners which were adopted by the Council of that Association and published in 1909.¹ The Central Midwives' Board has issued instructions to its teachers to draw the attention of the pupils to the early symptoms of uterine cancer. By such means it is hoped that women will seek advice immediately on the appearance of any unusual symptom, such as increased or irregular or traumatic loss of blood or the appearance of a new discharge; and that they will not always wait until severe bleeding, putrid discharge, or pain heralds the incurable stage of the disease.

More progress is to be anticipated from the better instruction of the rising generation of medical men in the early symptoms and early diagnosis of uterine cancer, and from the continued insistence on the fact of its curability in the early stages. It may be hoped that before long a medical practitioner will consider it a grave reflection on his professional competence to treat a patient for months without examination, and only when her disease is very advanced and herself cachectic, to send her to a consultant with the message that he "suspects" cancer.

The early recognition of the disease is making sure if slow progress. The proportion of operable cases of cervical cancer in my clinic has steadily risen from 14 per cent in 1896 to 1899 inclusive, to 36.4 per cent in 1910 to 1913 inclusive, and similar improvements appear now to be general in this country. In this direction lies the brightest hope of better achievement in the cure of uterine cancer.

PART IV

CANCER OF THE BODY OF THE UTERUS

Carcinoma of the body of the uterus presents several striking contrasts to cervical cancer. It is an adenocarcinoma; fibromyomata often coexist in the same uterus; the patients are frequently single and nulliparous, and the average number of pregnancies is small; the course of the disease is slower, and the opportunity for radical relief by operation persists for a longer time; in short, the malignant characters of body-cancer are less pronounced than those of cancer of the cervix.

¹ *Lancet*, 1909, vol. i. p. 1408.

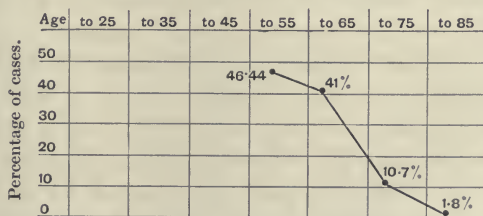
The known frequency of the disease has increased markedly with more exact observations, especially since surgery has afforded extended opportunities of inspecting uterine cancers in their earlier stage. Arnott¹ in 1870 among 57 post-mortem examinations found only 1 "remarkable case" where the cervix was free; Schatz² in 1876 found 2 in 80 cases; John Williams in 1888 stated that he had seen 12 cases believed to be cancer affecting the body of the uterus, but that only 3 had been proved. Gebhard,³ writing in 1899, states that uterine cancer affects the body in about 6 per cent of cases.

Incidence.—In a thesis published in the *Journal of Obstetrics and Gynaecology of the British Empire* in October 1904, I stated that 5·6 per cent of uterine cancers, seen by me, had been proved microscopically to begin in the body of the organ, and surmised that inasmuch as the majority of cases had already become advanced before being seen, a further proportion probably also began in the body. The disease is not one of poverty and neglect; a large proportion of the sufferers come from the comfortable, well-to-do classes. The age at which the disease makes its appearance is generally higher than that in which cervical cancer is seen. Of 56 cases in my own experience, analysed for the purpose of this article, the youngest was 47 and the oldest 76. Forty-nine of them were spread fairly evenly over the two decades 45 to 65, and 7 were 65 and upwards.

CARCINOMA OF UTERINE BODY UNTIL 1913, INCLUSIVE

AGE	
44	. . . 0
45 to 55	. . . 26=46·4 per cent
55 to 65	. . . 23=41 "
65 to 75	. . . 6=10·7 "
75 to 85	. . . 1= 1·8 "
	<hr/> 56 cases

AGE INCIDENCE OF CARCINOMA OF THE UTERINE BODY



Thirteen of 56 patients were single women, and a further 14 were nulliparous,

¹ Arnott, *Pathological Transactions*, 1870.

² Schatz, *Handbuch der pathologischen Anatomie*, 1876.

³ Gebhard, *Path. Anatomie der weiblichen sexual Organe*, 1899, p. 150.

thus half the total number of women affected had never been pregnant; of the remainder, 17 had passed through one to five pregnancies each, while only 2 had had 10 pregnancies or more. The total number of pregnancies was noted in 54 cases and amounted to 137, 112 of which went to term. The average number of pregnancies in each patient was thus 2.07 children, and 0.46 miscarriages, a total of 2.5. These figures present striking differences from those dealing with cancer of the cervix, which is common from the age of 35 onwards, occurs chiefly in married women, and is commonest in those who have had more than the average number of pregnancies.

As the age would suggest, a large proportion of the patients have already passed the menopause. Sometimes this occurs early, as in one patient who ceased to menstruate at 30; frequently it occurs late—in numerous instances at the age of 50 and upwards; so that it may be said that the climacteric age frequently differs from normal, but not in any definite direction; the menopause is sometimes earlier, more often later than usual.

The time that has elapsed since the last pregnancy is of interest; in 27 patients who had been pregnant, the interval that elapsed before the onset of cancer-symptoms was in no case less than four years, and in only three was it less than 10 years; while in no fewer than 13 the last pregnancy dated back 20 years or more, the space of time amounting to 40 years in one and 50 in another patient.

Varieties.—Cancer of the body has been classified according to the nature of the surface into villous, papillary, and nodular; these varieties correspond to no clinical or histological distinction and therefore are of merely descriptive use. A more important division is into localized and diffuse cancers, which represent stages in the progress of the disease (Fig. 282). In cases where the cancer is localized the average duration of symptoms, six months, is decidedly less than in the diffuse cases where it is fifteen months; in the diffuse cases the symptoms are usually more severe, many of the patients showing marked cachexia, while in the localized cases the health of the patient as a rule has suffered comparatively little. Further, in the localized cases the growth is more superficial, whereas in the diffuse cancers the growth has generally invaded the deeper layers of the uterine wall, and has sometimes spread to the cervix or given rise to peritoneal adhesions or to pyometra. There are, then, ample clinical and pathological reasons for considering that the localized and diffuse cases represent merely stages of the disease, and not true varieties.

Naked-eye Appearances.—To the naked eye corporeal cancer appears as a tumour which deforms the cavity of the uterus in proportion to the size and extent

of the growth. The surface of the growth may be *nodular* or lobulated and nearly smooth; more often it is *papillary*, covered with closely-set wart-like prominences conical or club-shaped, or *villous*, with long, delicate, thread-like processes. These fine soft villi may be several millimetres in length, are movable and float in water, and are only found in malignant adenoma and adenocarcinoma. As growth proceeds ulceration of the surface occurs, and in more advanced cases the cancer may appear as a hard irregularly-eroded infiltration of the endometrium. In the earlier localized stages of the disease the edges of the new growth are abrupt, and commonly overhanging. On section, the consistence of the new growth is usually soft in the early stages, and pale-reddish or rosy-grey in colour; the curette easily brings away considerable flakes and strips.

The carcinoma extends slowly into the muscular coat, and the limiting line, usually fairly sharp and well defined, is wavy with convexities outwards (Fig. 282). Late in the disease the new growth reaches the outer surface of the organ and makes its appearance under the peritoneum.

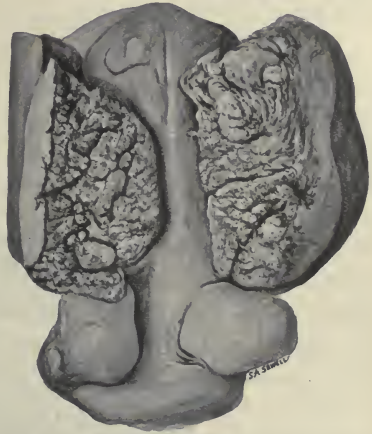


Fig. 282.—Localized adenocarcinoma extending over whole surface of anterior wall of body-cavity, forming an oval spongy mass 2 cm. in height, with villous surface, and overhanging edges. From an VIII-para, aet. 61, who had had blood-stained discharge for six months.

The uterus remains movable for long, but eventually becomes fixed either by widespread peritoneal adhesions, or by extension downwards to the cervix and surrounding pelvic connective tissue. Occasionally the growth takes origin in a womb that is already fixed by old inflammatory disease of the appendages.

As the growth extends, degenerations, from interferences with the blood-supply, commonly affect larger or smaller tracts of the tumour. Portions or even the whole tumour may appear yellowish-white and cheesy on section; the tissue then stains badly or not at all, only the nuclei being visible. This change has been described by Spencer¹ as caseation, but is probably to be considered rather as a coagulation necrosis. Sometimes parts of the growth have a jelly-like appearance due to mucoid or mucinoid degeneration. Very commonly a hyaline or keratinous change is seen, probably due to mucinoid degeneration followed by loss of moisture. Haemorrhages

¹ Spencer, *Proc. Roy. Soc. of Med. (Obstet. and Gyn. Sect.)*, vol. i. No. 5, p. 119.

into the substance of the tumour are frequent. Septic infection, ulceration, and sloughing are common in the later stages of the disease.

Minute Structure.—The typical cancer of the body of the uterus is an adenocarcinoma, which gives the appearance of developing progressively through stages which begin with malignant adenoma at the one end, and pass at the other into spheroidal-celled carcinoma; any of the stages may be missed or may persist for an indefinite time. Rarely a tumour of some standing may show the structure of a pure malignant adenoma; more commonly the earliest stage observed is that



FIG. 283.—Stratified surface-epithelium in the neighbourhood of the internal os; from a case of diffuse corporeal adenocarcinoma with pyometra.

of adenocarcinoma; but as a rule evidence of the evolution just mentioned may be discerned at different parts of the same tumour, and generally the most advanced stages appear to have been reached in the oldest and most central parts of the growth, while at the growing margin the earliest stages are seen.

Squamous epithelioma has many times been described as affecting the body of the uterus, and it has been said to take origin in a preceding metaplasia of the lining epithelium into a many-layered epithelium, the upper layers of which have undergone horny transformation. This condition has been called uterine ichthyosis; the surface appears as if covered with a peculiar opaque whitish layer, “like the sugar

icing on a cake"; from such a change it is easy to suppose that squamous epithelioma may arise. I have frequently seen the surface-epithelium forming a covering several layers deep (Fig. 283), but have never observed any appearance that would suggest that a cancer was originating in down-growths from the deeper layers of such a covering, and I believe such a condition to be extremely rare if it occurs at all. Horny or keratoid degeneration is very frequently met with in cancer of the body of the uterus, and such cases have been described by Targett,¹ Lewers,² Lockyer,³ and others. Among my own cases were several instances which appear to prove that the keratoid change occurs in the oldest and most degenerate portions of many of the tumours that otherwise show the typical structure described above. In those alveoli that are solidly filled, groups of epithelial cells, especially in the central portions of the alveoli, undergo a hyaline change, the cell-bodies becoming swollen and homogeneous, taking on a diffuse stain, and finally becoming fused together so that the structure is lost. The nuclei at the same time undergo a remarkable change; they become swollen, stain less readily and more diffusely than usual, and finally break up into irregular fragments and granules. In the cell-bodies also concentric lamellae are often developed, and a group of cells that has undergone this degeneration frequently presents the appearance of a 'cell-nest,' or 'epithelial pearl,' such as is typically found in epithelioma.

Cases that have been described as squamous epithelioma do not stand the test of criticism; the term ought to be reserved for the form of growth that begins in squamous epithelium and is fully developed from the start; where the appearances described are due to degeneration occurring in the later stages of a tumour that passes through a well-defined course of development, such as does the glandular cancer of the uterus, it is better to speak of the tumour as a keratoid, or keratinising, adenocarcinoma.

Growth and Spread.—The earliest beginning of cancer of the body of the uterus is unknown; when its acquaintance is first made it already forms a definite nodule visible to the naked eye, with a characteristic structure; the growth extends in all directions: centripetally from the surface into the cavity of the uterus—*exophytic*; centrifugally into the thickness of the muscular wall—*endophytic*; and especially over the surface. In the mucous membrane lining the body superficial extension of growth appears to be easy, and the cancer tends to spread over the whole endometrium, the extension being bounded for a time, however, by the internal os. Extension takes place by proliferation of the tumour-elements and not

¹ Targett, *Trans. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, 1910, vol. iii, p. 153.

² Lewers, *Trans. Obstet. Soc. Lond.* vol. xlv, p. 97.

³ Lockyer, *Trans. Obstet. Soc. Lond.* 1903, vol. xlv, p. 376.

by malignant conversion of the original tissue-elements. A careful examination of the growing edge shows that the endometrium ceases abruptly. Sometimes the endometrium and the new growth are closely contiguous, in which case the tumour may overlap the margin of the mucous membrane. Sometimes, at the margin of the growing tumour, haemorrhages are seen in the surface-layers of the endometrium ; at others there is an intervening band of connective tissue which may be of considerable breadth, and show more or less marked infiltration with round cells. The mucous membrane in other cases is continued over the surface or upwards round

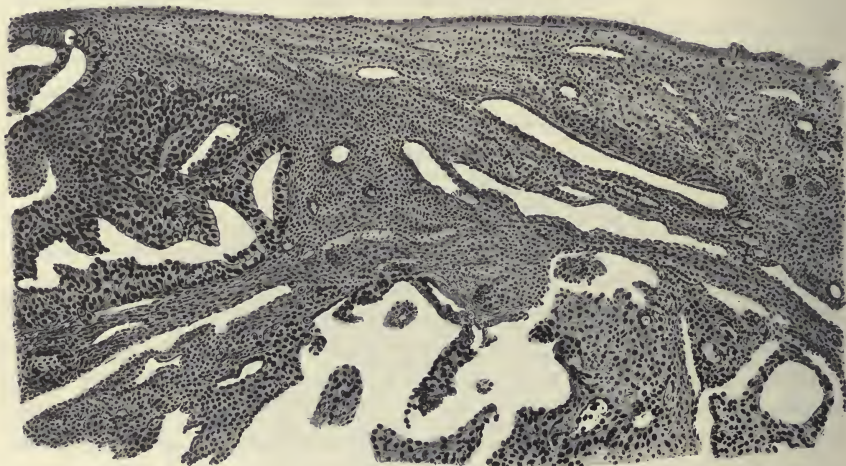


FIG. 284.—Portion of edge of localized adenocarcinoma. There is a surface-lining of cubical epithelial cells, which are swollen, and arranged in two layers towards the right. The difference in size between the glandular and cancerous epithelial cells is well seen.

the side of the cancerous tumour for some distance, and usually shows marked signs of atrophy (Fig. 284).

The growth may begin at any part of the endometrium. In most cases the condition is already too far advanced for the exact point of origin to be determined, but in some at least it appears certain that the cancer makes a beginning at or in the near neighbourhood of the isthmus. In 4 out of 38 operation cases of corporeal cancer, a localized tumour involved the isthmus, which might very well have been the starting-point (Fig. 285).

For a time the cancer forms a localized affection which invades the neighbouring parts of the uterine wall by growing into the spaces of the muscular coat ; after a

time that is usually considerable, it invades the larger lymphatic vessels as well as blood-vessels of considerable size, and then rapidly spreads beyond the limits of the uterus (Fig. 286).

The *endometrium* at a distance from the growth shows signs of senile atrophy more or less marked according to the time that has elapsed since the menopause. There are often evidences of endometritis, interstitial or glandular, and pedunculated mucous polypi are common at some distance from the edge of the cancerous growth (Fig. 287).

The endometrium in the vicinity of the cancer often shows well-marked signs of irritation, such as increased number and irregular arrangements of the epithelial cells covering the surface or lining the glands. Sometimes it is thickened, white, and opaque, the so-called leucoplakia or ichthyosis. An increase in the number of layers of epithelial cells covering the surface is often seen, and occasionally there is formation of buds or of finger-like projections into the lumina of the glands, such as is seen normally in the early months of pregnancy. Frequently also there are numerous cast-off epithelial cells in the glands, or on the surface of

the mucous membrane. All these changes appear to be due to a catarrhal condition which may either have preceded the development of the cancer or have been set up by irritation due to its presence. Similar changes are observed in the endometrium at a distance from the cancer. In my cases there is no evidence of the conversion of the epithelial cells of the mucous membrane into cancer-cells, and when the two are seen close together there are often extreme differences in size and staining (Fig. 284).

The *muscular wall* of the uterus sometimes appears to be thickened when considered in relation to the age of the patient; more frequently there is marked thinning. Microscopically, in the uninvaded muscle there are frequently signs of oedema or patches of colloid degeneration, and in the neighbourhood of the growth infiltration, with small round cells in bands or patches, is frequent.



FIG. 285.—Localized adenocarcinomatous ulcer extending upwards from the isthmus; second separate focus at the fundus.

The *peritoneal coat* remains smooth and shining until late in the disease when the growth has invaded the whole thickness of the wall; when this happens white or yellow patches or nodules are found in the peritoneal coat, which soon loses its lustre and contracts adhesions to contiguous viscera, most commonly the intestine, omentum, or mesentery. Metastases in the peritoneum may arise either by wandering of separated fragments, or directly through the adhesions or mesentery.

The *cervix* frequently shows marked evidence of inflammation; infiltration with small round cells and many-layered patches of surface-epithelium are commonly

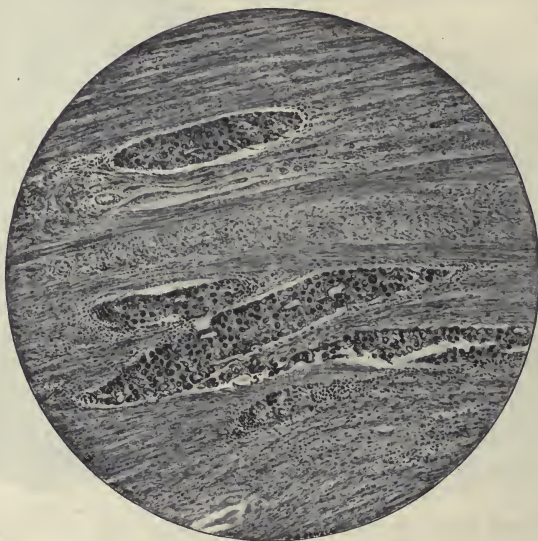


FIG. 286.—Outer layers of muscular wall of uterus, showing large lymphatic vessels filled with cancer-cells; from an advanced case of corporeal adenocarcinoma.

seen. In the later stages of the disease the cervix becomes invaded by the new growth, chiefly by extension along the larger lymphatic vessels in the outer layers of the muscular coat. Less commonly, the cancer spreads along the surface to the cervical canal.

The *vagina* is sometimes invaded, chiefly by lymphatic extension to the muscular coat, as in one of my 38 operation cases. Less commonly, the disease spreads along the surface into the vagina in the later stages of the disease; and rarely implantation metastasis occurs.

The *lymphatic glands* usually remain free from infection until late in the course of the disease. The glands first invaded are either the juxta-aortic at the level of

the lower border of the kidneys, or the interiliac. In the latter case the infection takes place along the anastomoses between the lymphatic vessels of the body and cervix.

The *pelvic connective tissue* is involved late in the disease when the cancer has become diffuse and has often spread to the cervix.

The *ovaries* are the most common seat of metastatic growths in cancer of the body of the uterus. In 7 of 38 cases there were secondary nodules of greater or less size in one or both ovaries. These nodules in several cases were small and only



FIG. 287.—Localized adenocarcinoma extending upwards from the isthmus and almost completely encircling the cavity. The polypoid projection higher up showed simple glandular structure. From a single woman of 67, who passed the menopause at 54, and had had blood-stained serous discharge for five months; no marked bleeding and no pain.

apparent on careful examination. In others the ovarian growths, while almost certainly secondary, far exceeded in size the primary uterine cancer. The ovarian infection may take place through the peritoneum after the growth has penetrated the walls of the uterus; more commonly, by way of the lymphatic vessels in the meso-varium; and possibly, by way of the larger blood-vessels.

The *Fallopian tubes* may be invaded by direct growth either along the surface of the mucous membrane or along the muscular wall (Fig. 288), or they may be invaded by way of the lymphatics.

Metastases in the remoter organs are relatively rare. In two of my cases the *pelvic colon* was affected. In one the two tumours were apparently unconnected,

separated by a clear interval, and of about the same degree of development; abdominal hysterectomy was performed with success, but the colonic tumour could not be removed. In the second case no tumour in the rectum or sigmoid was detected at the removal of a corporeal cancer by abdominal hysterectomy; but two years later a large mass had formed in the pelvis, had invaded and perforated the wall of the upper part of the rectum, and made its appearance in the base of the bladder. Czempin¹ published a case in a woman of 54 who died sixteen hours after operation;



FIG. 288.—A section of the interstitial part of the Fallopian tube invaded at one side by adenocarcinoma which is infiltrating the muscular uterine wall. ($\times 80$)

extension had taken place from a cancer of the uterine body along the uterosacral and the broad ligaments to the sigmoid flexure.

Complications.—*Multiple Tumours.*—The body of the uterus is peculiarly prone to be involved, alone or with neighbouring organs and structures, in multiple tumours. Fibroid tumours commonly coexist with cancer of the endometrium. In a recent case a polypoid sarcoma of the cervix was present along with adenocarcinoma at the fundus. Multiple malignant foci in the body, or in cervix and body, have been frequently reported. Two or more tumours may coexist, or succeed each other in the

¹ Czempin, *Centralblatt für Gynäkologie*, No. 50, 1894; cf. also Wells, *American Journ. of Obstetrics*, June 1908.

uterus and the appendages, and may arise independently, or either organ may be secondarily involved in primary disease of the other. In one of my cases a cancer of the cervix was present, with secondary cancer in both ovaries and a considerable-sized fibroid of the uterine body. In another a pseudomucinous cyst was removed from the right ovary, and five months later, a similar one from the left ovary; six years later still, the uterus was removed for diffuse adenocarcinoma of the body; a



FIG. 289.—Uterus and appendages, showing fibroids of fundus and posterior wall, and adenocarcinoma forming a prominence at the fundus. From a single lady of 47, in whom irregular and excessive haemorrhages had persisted for 1½ years. The patient was profoundly anaemic, and had repeated attacks of thrombosis in small leg-veins. Recurrence in left lumbar glands 2½ years after operation.

fibroid the size of a cricket ball had been known to be present since the first ovariectomy.

Fibromyoma.—A very large proportion of cancers of the body occur in uteri that are already affected by fibroids, a fact in striking contrast to the small number of cases in which fibroids complicate cancer of the cervix. In none of the cases has there been any reason to infer that the cancer began in the fibroid tumour itself, though not uncommonly the tumour is invaded by the cancer, the invasion beginning at the surface (Figs. 289, 290). The frequent concurrence of the two forms of disease

render probable the existence of some link in causation; it is well known that the presence of fibroids frequently sets up a condition of chronic interstitial endometritis, and it is at least possible that the diminished resistance of the endometrium brought about by such an endometritis is the predisposing condition that allows cancer to take root.

The coexistence of fibroids with cancer of the body is of great importance from the practical point of view; any symptoms that may be present are only too likely



FIG. 290.—Vertical antero-posterior section of uterus seen in Figure 289, showing diffuse adenocarcinoma of the body which has invaded the whole thickness of the fundus, and has become adherent to mesentery. There is a small interstitial fibroid in the posterior wall.

to be set down to the fibroid, and in this way the growth of a cancer of the uterine body may be, for a considerable time, overlooked. In the presence of fibroids, if the menses cease for a time and begin again, or if bleeding increases; or if a profuse serous, mucous, or coloured discharge makes its appearance, especially after the climacteric, the cavity of the uterus should be explored without delay, and in case of doubt the uterus should be removed.¹

¹ This subject is further discussed in the Articles on Myomata and Adenomyomata in this Volume (see pp. 240, 273-274, and 372).—EDITORS.

Adenomyoma.—Diffuse collections of adenomyomatous tissue were found in the muscular coat of 5 of my 38 cases of adenocarcinoma of the uterine body (Fig. 291). The adenomyomatous tissue appeared to have arisen in connection with the endometrium, and there was nothing to suggest that the malignant tumour had arisen in, or in close relation with, the adenomyoma, or that the latter growth at any part was itself becoming malignant.¹

Pyometra.—In four of my 38 operation cases of cancer of the body, all of them

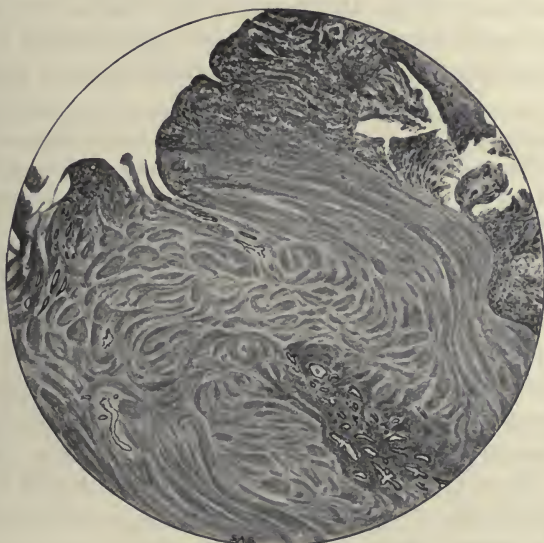


FIG. 291.—Adenomyoma. The border of an adenocarcinoma is seen above and to the right; the atrophied endometrium borders this, and a narrow process with glands penetrates under the margin of the tumour. Deeper in the substance of the uterus is an island of adenomyomatous tissue. ($\times 45$.)

old-standing diffuse tumours, the uterine cavity was distended with puriform fluid. The fluid may be true pus or *débris* from the breaking-down surface of the cancer.

The mechanism of retention appears to vary in different cases; sometimes the discharges are prevented from escaping by an obstruction in the lower part of the cavity of the organ; in other cases it appears that the invasion of the wall of the uterus by an inelastic growth takes place progressively, and being at the same time accompanied by ulceration of the surface, produces a real cavity in the body of the uterus, from which pus is not expelled because the contractile power of the uterus is destroyed.

¹ See Adenomyomata and Malignancy (pp. 368-370).—EDITORS.

Pelvic Inflammations.—In about 20 per cent of my cases evidence of old inflammation about the appendages was present in the form of adhesions, or of catarrhal or suppurative salpingitis or pyosalpinx. In one case a small ovarian cyst, probably a theca-lutein, was observed.

Early Symptoms of Corporeal Cancer

Suspicious symptoms have usually been present for a very long time before the patient seeks competent advice. Of 56 cases noted, in only 2, both inoperable, had symptoms been present for less than three months; in 35 they had been present for one year and upwards, in one case for five, and in another for ten years.

CASE 6. A widow aged 76 had one child when she was 26, and no other pregnancy; the menopause occurred when she was 51, and at 66 "the periods started again and were fairly regular." There had been constant discharge of moderate amount for the same time; for the last year severe pain in the left groin and frequency of micturition. Cystoscopy disclosed nothing abnormal. The uterus was enlarged, nodular, and fixed. The sound passed three inches. The examination of curettings showed malignant adenoma and adenocarcinoma.

Of the 35 cases in which symptoms had been present for more than a year 24 were dealt with by radical operation. The duration of symptoms by itself is no sure index of the stage at which the growth has arrived; in some very advanced cases the symptoms had been noted for only a few weeks or months, whereas on the other hand in tumours at an early stage symptoms have sometimes been present for many months. On an average, however, it has been found that in localized cancer of the body symptoms have been present for six months, in diffuse cancer for fifteen months, and in advanced inoperable cases for two years.

Speaking generally, the symptoms resemble those of cancer of the cervix, and here also none is pathognomonic. The usual order in which the complaints arise are, first, discharge, often blood-stained; next, irregular and more or less profuse bleeding; and third, pain. In the majority of cases the first symptom is a thin serous or watery discharge, pale and colourless, or blood-stained and resembling meat-juice. After a time, especially when ulceration begins, the discharge becomes more opaque, white or yellow, thicker in consistence, often brown or red from admixture with blood. The discharge does not become offensive, as a rule, until the later stages of the disease. This is in contrast to what happens in cervical cancer where the discharge early becomes putrid, especially when the disease begins on the vaginal surface.

When cancer begins in a uterus already enlarged by fibroids that are causing menorrhagia, the early symptoms of the malignant invasion are apt to be masked,

and to remain unperceived often for long periods. In this way the favourable opportunity for cure by operation may easily be missed.

Pain is not present in the early stages; in not a few cases no severe pain is experienced throughout the whole course of the disease. A feeling of heaviness and fulness and of general discomfort in the pelvis is common. Sometimes pain is the first symptom mentioned, but careful enquiry shows that other symptoms have preceded it. Simpson described as an early symptom, in these cases, regularly recurring attacks of severe colicky pain in the lower abdomen. This would appear to be rare and I have seen only one such case. The pain is described as a severe bearing down, and appears to be due to efforts of the uterus to expel the cancerous tumour from its cavity.

In the advanced stages of the disease, when the cancer has extended beyond the uterus to the connective tissue and peritoneum, severe and continuous pain, worse at night, begins, and where the peritoneum is affected, the pain is accompanied by tenderness, and rigidity of the lower abdomen. General cachexia has developed, and the further consideration of such cases will be undertaken on a later page along with that of advanced cervical cancer.

Diagnosis

The diagnosis of cancer of the body of the uterus often depends entirely on the examination of curettings, all the other methods of examination failing to give characteristic information, especially in the early stages of the disease.

An objective examination should be made with the least possible delay in every woman who complains of suspicious symptoms. The examination should not only be prompt, but complete and thorough, and an anaesthetic should be administered if any difficulty is encountered. There are no really early symptoms, and the delay of a month in making the necessary examination may sacrifice the patient's chance of a radical cure. The physical investigation of a case of suspected cancer of the uterine body will now be described in the order in which it is usually carried out.

Abdominal examination sometimes discloses a tumour rising out of the pelvis, but only when the disease is already far advanced, or when fibroids are present. In the great majority of cases there is no tumour, nor other physical change until the late stages, when tenderness and rigidity make their appearance.

The vulva and vagina show nothing abnormal; in the great majority of cases the signs of senile atrophy are marked, and, in a large proportion, those also of virginity.

The cervix on examination by finger and speculum is often found closed, and apparently in every respect normal. In most cases the vaginal projection has more

or less completely disappeared and the cervix is small, as is normal after the menopause. Occasionally, especially in the later stages of the disease, the cervix is open, allowing the finger to feel an irregular, nodular, or soft tumour occupying the interior of the uterus; sometimes too, in the last stages of the disease, the cancer infiltrates the walls of the cervix throughout.

Bi-manual examination in these patients is often difficult and unsatisfactory, and may have to be put off until an anaesthetic can be administered. In the early stages of the disease no enlargement of the body is present. Often, at the first examination, the cancerous uterus in a patient of fifty-five or sixty is found to be about as large as during adult sexual life; such a size means, of course, decided enlargement of the body, which at this time should be small and slender, or shortened, and not uncommonly retroverted. As the tumour grows the body of the uterus becomes still more enlarged; its shape is altered, being often rounded, and sometimes irregular. The consistence of the organ becomes altered and often varies at different parts; in some places it is nodular, inelastic and hard, and in others firm elastic, as in the normal condition. The enlargement is due mostly to infiltration of the walls of the organ by the new growth, but occasionally it is caused by the retention of puriform fluid in the ulcerated cavity. During the examination there is generally more or less bleeding; as a rule the amount is slight, and on gentle manipulation there is occasionally none; its occurrence is suspicious, but by no means peculiar to cancer.

In body-cancer the uterus retains its mobility until quite late in the disease, differing notably in this respect from cancer of the cervix. This difference is partly due to the slower growth but chiefly to remoteness of the new growth from the connective tissue. Interference with the movement of the uterus is due mostly to invasion of the peritoneum with consequent adhesions to intestine, omentum, and pelvic walls, to the increase in size of the organ, and only in the later stages to the invasion of the cervix and surrounding connective tissue.

Further information may be sought by the use of the sound, which is, however, of limited use. In the early stages the uterine cavity is not elongated, nothing definite can be felt, and the only obvious effect of the sound is to cause notable bleeding, which should excite particular attention. In some cases the sound may be felt to penetrate and break down firm or soft friable growth; in fungous endometritis similar friability may be detected, and bleeding be caused by the sound, so that the information thus gained merely heightens the presumption of cancer, and indicates the necessity for carrying the investigation further. The attempt to make out irregularities and prominences of the inside of the uterus is fallacious. In using the instrument care must be taken lest the sound penetrate the cancerous wall of

the organ and cause inoculation of the peritoneum either with cancer-cells or with septic germs.

In the early stages of the disease the diagnosis is only possible by examining the interior of the uterus after dilatation of the cervix. There are two methods of examination: (1) digital, (2) curetting, and subsequent examination of the portions removed. Digital examination is sometimes easily carried out, the cervix being already dilated. Where the cervix is closed, the dilatation required to allow of the finger being introduced is not to be undertaken lightly; inevitable lacerations and injuries may lead to the further extension of the growth particularly by way of the lymphatics. Moreover, in early cases the information that may be expected to be gained by the finger is of less value than that obtained by the curette.

Curetting can be efficiently carried out through a cervix dilated to No. 12 or No. 14 Hegar, and this amount of dilatation can usually be carried out without serious lacerations. The examination should be performed under anaesthesia and with all necessary antiseptic precautions. The scraping should be thoroughly done, the whole surface of the cavity being carefully gone over, and all the fragments must be carefully collected. Long strokes should be made with the instrument so as to get as large sections as possible, and finally the cervix also should be carefully curetted. If rosy-grey or opaque white fragments of tissue are removed in notable quantity by the curette, the diagnosis is reasonably certain. In early localized cases a small focus of disease may easily be missed, and as the pathologist can only pronounce upon what is submitted to him, the diagnosis may fail. It is impossible for the microscope to prove the absence of body-cancer unless portions of every part of the endometrium are submitted to it. When the curetting is finished it is advisable to apply some efficient antiseptic, such as strong solution of iodine to the inside of the uterus. In advanced cases it is necessary to take care not to perforate the wall of the uterus with the curette, an accident that may easily happen even in skilled hands. The friable growth is sometimes found to have penetrated the whole uterine wall up to the peritoneum.

Examination of Curettings.—The curettings are all caught in a bowl filled with normal salt solution in which the blood is dissolved out and washed away. The whole of them are then hardened, embedded in paraffin, and solidified in one mass; a convenient method is to carry out the final paraffin bath in a test-tube, which is inverted on to a cork or wood block so that the curettings may gravitate to form a mass. By this means each section cuts across several portions of tissue from different parts of the inside of the uterus, and any malignant patch is very unlikely to escape observation.

The formation of an opinion as to the nature, simple or malignant, of curetted fragments is often easy; in certain doubtful cases a wide practical experience is necessary. The evidence afforded by a fragment, however small, of characteristic malignant tissue is conclusive. It is, however, possible that a malignant nodule in the wall of the uterus may be covered by normal or inflamed mucous membrane, or that the curetting may have been imperfectly done, or the pieces not fully collected. The microscopist can only pronounce an opinion on the portions of tissue supplied to him, but with increasing experience he is able to decide with great confidence on the simple or malignant nature of any given fragment.

Attention has to be paid to the number, character, and general arrangement of the alveoli and to the epithelial cells. In malignant adenoma and adenocarcinoma the gland-like spaces are greatly increased in number, so that they often lie close together with only a fine dividing line of spindle cells between them; the epithelial cells are placed back-to-back, instead of face-to-face. The acini frequently undergo repeated division and subdivision, and show an extreme irregularity of course, forming an intricate network in which it is impossible to distinguish the individual glands. In simple endometritis the separate glands are distinct, run chiefly vertical to the surface, are usually distant from each other by a space greater than their diameter, and rarely divide more than once; the superficial part of the endometrium is usually poor in glands. Penetration of the glands into the muscular wall is not a sign of malignant disease; in normal and still more in a chronically inflamed endometrium, this process is common.

An increase in the number of layers of cells lining the acini is one of the most important signs of malignant disease, but is often simulated in thick or oblique sections of normal glands. In malignant adenoma there is only one layer, often of beautiful high cylindrical cells; this layer often, however, appears irregular from the nuclei being placed at very varying levels. An increase in the number of cells may cause the projection of bundles or faggots of cells towards the lumen of an alveolus, an appearance always to be regarded with suspicion. A similar appearance is frequently met with in the deeper layers of the decidua vera in the early months of pregnancy; but here the presence of large collections of decidual cells would be an important indication of the nature of the section.

Diagnosis of cancer-curettings has to be made not only from scrapings of endometritis and from conditions depending on pregnancy, but from other forms of malignant disease—sarcoma, endothelioma, and chorionepithelioma. In some of these conditions the exact nature of the malignant tumour can only be determined after a complete examination of the affected uterus, but microscopic investigation of

curettings, with the precautions above described, will enable an opinion to be formed with practical certainty as to the simple or malignant nature of the material removed.

Differential Diagnosis.—When in a woman who is unmarried, or who has proved sterile or little fertile, a serous or other discharge makes its appearance at or especially after the menopause, or where bleeding becomes excessive, prolonged, or irregular at the same epoch, a strong presumption of cancer is always raised. Younger women are of course frequently affected by malignant uterine disease, but in them the affection is more commonly sarcoma, or a rapidly fatal chorionepithelioma. The occurrence of true cancer of the uterine body in women under forty-five appears to be rare.

The distinction has often to be made from *senile endometritis*. Well-marked cases of the latter affection are less common than cancer; the discharge is purulent and usually offensive, and bleeding is absent or slight; the patient complains of pelvic discomfort, but not of actual pain. On examination, signs of vaginitis are present as a rule; the uterus is not enlarged, or is enlarged and elastic from distension with pus; the organ is usually movable. The physical signs do not enable the diagnosis to be made from cancer; curetting is necessary, and should be done without delay. There are strong grounds for suspicion that, in some cases, endometritis is a precursor of carcinoma.

Chronic metritis in certain cases may call for exploration with a view to diagnosis. The condition occurs at a lower age, and where the leading symptom is haemorrhage, it has as a rule the character of menorrhagia, and is much more profuse than is usual in cancer. The uterus is enlarged, sometimes considerably, the form regular, and the consistence hard.

Mucous polypi of the cervix may be present along with cancer of the body of the uterus, and call for care in diagnosis; they not uncommonly themselves also become the seat of malignant disease. Necrotic myoma, retained placenta, and retained products of abortion occasionally give rise to suspicion of malignant disease, but the diagnosis is easily made by a thorough and careful examination.

In large *fibroid tumours* where the menopause is postponed the greatest care and circumspection is often necessary to prevent the onset of malignant disease being overlooked. An increase in the amount or duration of the bleeding, irregularity, the onset of a new or more profuse serous or serosanguineous discharge, or the occurrence of severe abdominal pain call for the most careful investigation, or better still for radical intervention with the least possible delay.

Radical Treatment of Cancer of the Body of the Uterus

In cancer of the uterine body radical surgery gives much better results than in cervical cancer; the adenocarcinomatous types of cancer are slower in their growth and later in becoming generalized than the solid varieties. The disease is usually found in a uterus that has already undergone senile atrophy with consequent lessened vascularity and diminished circulation; the patients are frequently nulliparous, and the texture of the uterus is consequently closer; the uterine body is almost entirely covered by peritoneum, and the connections between its lymphatic vessels and the large collecting trunks are less numerous and intimate than obtains with those of the cervix. For all these reasons the tumour remains localized for a longer time in the body of the uterus, and only in the later stages extends beyond it into the cervix, with corresponding involvement of the usual cervical avenues of extension, or into the ovarian lymphatic vessels, and thus to the lumbar glands.

The percentage of operable cases and the rate of freedom from recurrence after operation are high. Wertheim¹ states that the operability of cancer of the body in his clinic is 97 per cent. Vaginal hysterectomy has given good results as regards freedom from recurrence; Lewers,² for example, found 5 out of 11 cases free from recurrence for more than four years.

In planning a radical operation for body-cancer, it is not necessary to remove either the parametria or the upper third of the vagina. The pelvic glands remain free until the growth spreads to the cervix late in the disease, and the lumbar glands are difficult, or impossible, to remove and fortunately remain free, as a rule, until quite late. Some operators are still of opinion that vaginal hysterectomy is the operation of election for these cancers; against this view it may be urged that the vaginal operation is often difficult because of the narrow and rigid vagina; and those who have seen implantation-cancer in the vagino-perineal incision are apt to prefer the abdominal method of operation. The latter method affords a better oversight, and enables the appendages to be removed easily and completely, and the broad ligaments and parametria to be divided as wide of the growth as seems desirable. The abdominal operation in these cases is now becoming comparatively safe, so that the immediate mortality has ceased to be an argument against its employment. At the present time the tendency of most operators is to adopt the abdominal operation as the method of choice.

The final results obtained in cancer of the body have been remarkably good, considered from the point of view of cancer generally. Most of the available statistics

¹ Wertheim, *Trans. International Congress of Medicine* (London, 1913), p. 99.

² Lewers, *Cancer of the Uterus*, London, 1902.

are incomplete or refer to cases that have been operated upon for too short a time ; thus Cullen¹ states that 60 per cent of his cases remained well for eleven months to six years, and Anderson and Platt² state that out of 48 cases of cancer of the body, 39 of which were operated upon, 22 remained free from two to seven years. Five-year statistics have been published by Winter, who had 16 cases remaining free from recurrence for five years out of a total of 30 operations, and by Mayer,³ who obtained 13 cures out of 26 operations. My own complete results up to June 30, 1909 refer to 50 cases of five years' standing and upwards ; 31 of the cases were operated upon by vaginal or abdominal hysterectomy with two deaths, an immediate mortality of 6·4 per cent ; 12 of the patients remained free from recurrence at the end of five years, so that the absolute curability was 24 per cent, showing that the outlook was fully twice as good in cancer of the body as in cancer of the cervix occurring in the same clinic. Wertheim's primary mortality was 10 per cent, and 51·2 per cent of his cases remained well after five years.

Later Stages of Cancer of the Body of the Uterus

Recurrence following operation is less common in corporeal than in cervical cases, but it may occur locally or in the lumbar, iliac, or inguinal glands, or in distant organs. Unless special precautions are taken, the growth may also recur in the incisions made during the operation through the abdominal wall, or in the perineum.

Duration.—The course of corporeal cancer is, generally speaking, slower and more favourable than that of cancer of the cervix. The same difficulties exist in estimating the age of the disease, but, broadly speaking, the average duration is about twice as long, varying from two to four years or more from the onset of recognizable symptoms until the death of the patient.

Causes of Death.—The fatal issue may be brought about by the same variety of causes as in cervical cancer, but in body-cases pressure on the ureters and uraemia seem to occur less commonly, while sepsis and its effects, and affections of the peritoneum, are relatively more frequent causes of death.

Final Stages.—In unoperated cases the tumour, as it extends, eventually invades the cervix, and then spreads to the pelvic connective tissue and to the other organs, in the same way as cancer beginning in the cervix. In the latest stages of the disease there are so many points common to the two varieties that a separate discussion of

¹ Cullen, *loc. cit.* p. 644.

² Anderson and Platt, *Journ. of Obstet. and Gyn. of the British Empire*, 1908, vol. ii. p. 381.

³ Mayer, *Monatsschr. für Geb. und Gyn.* Bd. xxxiii. H. vi.

their progress and treatment would only lead to useless repetition. Parts V. and VI. may therefore be taken to apply to corporeal as well as to cervical cancer.

PART V

TREATMENT OF UTERINE CANCER IN THE INTERMEDIATE STAGES

Between the late stage of the disease, when cachexia has developed and euthanasia alone is possible, and the early operable stages, come the majority of the cases of uterine cancer that are under treatment. In these as well as in recurrence after operation palliative treatment is indicated, and by its means much may be achieved, even an occasional cure. Innumerable methods have been suggested and tried; they may conveniently be divided into those which aim at the complete cure of the disease, and those which are intended to mitigate or relieve symptoms, general or particular.

A. Suggested Curative Methods

Suggestions for the radical cure of cancer without surgical operation have been many and various, and all of them up to the present equally unsuccessful. They may be divided into general and local.

I. General Methods.—These have sought to antagonize cancer by modifications in diet, by the administration of drugs, or by introducing antibodies in the form of certain ferments, serums, and the like. A strict vegetarian diet has been recommended by some, a purin-free diet, and a two-meal system by others as the chief foundation of the general treatment of cancer.

Drugs without number have been introduced by the mouth, by the rectum, under the skin, and into the veins. Arsenic, in the form of Fowler's solution and in sodium cacodylate, mercury, and quinine have been tried. Decoctions of cinnamon, of violet leaves and alder leaves, and nettle infusions, condurango, chelidonium majus, charcoal, and cholesterin, have all been recommended. Jequirity in gelatine discs has been administered internally, alternately with the application of a 30 per cent ointment. Cinnamate of soda (30 minims of a 10 per cent solution) or orthocoumarate of soda (25 minims of a 22 per cent solution) has been given hypodermically twice a week for three months. Hypodermic injections of one drachm of oleate of soda have been administered, and the effect has been said to be enhanced by the internal administration of ox-gall. Chian turpentine has been given in the form of pills, or used subcutaneously in the form of a 20 per cent solution in olive oil; five minims

gradually increased to sixty minims have been injected deeply into the gluteal muscles. Most of these agents cause severe pain, and the seat of injection is usually prepared by the previous injection of eucaïne or cocaine.

The introduction of salvarsan in the treatment of syphilis led to a search for a similar curative agent for cancer. Favourable results were obtained by Wassermann in mouse-cancer with injections of an eosin-selenium compound, but the effective and lethal doses were uncomfortably near to each other, and the results became more unsatisfactory the farther they got from the lethal dose; too low a dose actually stimulated the tumour, and a large percentage of the animals died from the absorption of the degenerative products of the tumours.¹ Colloidal copper has been injected deep into the muscles in human cancer.²

The organs of internal secretion have been exploited. Thyroidectomy has been tried, and small doses of thyroid extract, carefully watched, have been given for long periods after operations.

A committee of the British Medical Association³ has pointed out that cancer is extremely rare in old age in man as well as in animals; the incidence is greatest between the ages of 45 and 65 when the activities of the reproductive organs are on the wane. This suggests a relation to perverted or diminished functioning of the reproductive organs, whose internal secretions restrain the growth of the somatic elements. Following out this line of thought injections of spermin (Poehl), of fresh emulsion of mouse-testis, and of orchidin have been made in cancerous animals, but hitherto with no definite results.

Ferments and their Allies the Hormones.—Trypsin was first employed by Shaw-Mackenzie on the clinical grounds that cancer is rare in the duodenum, and that cancer and diabetes are frequently observed in different members of the same family. About the same time Beard asserted that trypsin has a specific action on cancerous as opposed to normal tissues. The agent may be administered by the mouth or by hypodermic injection; or it may be used locally, in which case sloughing tissue is speedily removed, and a clean surface free from sepsis painlessly obtained. According to Shaw-Mackenzie, injection at a distance from the cancer cannot be expected to benefit much since the blood has certain antitryptic powers; and injections into the tumour itself gives rise to intense pain. Evidence as to the value of trypsin in cancer is contradictory, but on the whole negative. F. C. Wallis gave 15- to 30-minim doses of trypsin for nearly three months in 7 cases without any good result.

¹ *Brit. Med. Journ.*, 1912, ii. p. 449.

² Herschell, *Trans. Roy. Soc. Med. (Therapeutic Sect.)*, January 1913, p. 76.

³ Committee British Medical Association, *Lancet*, 1910, vol. ii. p. 1030.

Numerous other ferments have been suggested in the treatment of cancer, and tried with little or no benefit. Among them may be mentioned amylopsin, liver ferment, papayotin, erepsin, and placental tryptic ferment.

Cholin has been recommended by Werner of Heidelberg to be employed in association with radium, mesothorium, and Röntgen rays. Two or three c.c. of a 10 per cent solution of borate of cholin were diluted to 20 cm. and injected intravenously once a day for three to four weeks. The course was repeated after an interval of four to six weeks, and between times Spa treatment with radium-waters was employed, and arsenic given internally. Werner's cases included five uterine cancers in which the tumours almost or quite disappeared, though he does not claim the cases as permanent cures.

Serums and Vaccines.—Many efforts have been made to find a curative serum or vaccine. Doyen's much advertised antitoxic serum obtained from horses inoculated with the *micrococcus neoformans* was found by Paine and Morgan after careful trial to be always useless and sometimes dangerous. Schmidt's serum and vaccine made from cancer-parasite was tried and found wanting at the Middlesex Hospital by Morris. Blastomycetic serum (Sanfelice) and caneroïn (Adamkiewicz) may be mentioned as further attempts at the discovery of an effective serum. Grünbaum has treated cancer by cobra antivenom serum, by viper-venom vaccine and X-rays, and by antidiphtheritic serum. Copeman found that patients suffering from breast cancer who had oedema of the arm, were much better for several months after being bled ten to thirteen ounces; but their serum injected into themselves or into other cancerous patients gave no beneficial results.

Bashford¹ has discussed the theory of immunity in relation to cancer, and distinguishes two kinds of immunity to transplantable tumours, each with its own peculiar mechanism. The resistance of mice to homologous cancer may be increased experimentally by injections of living mouse-cancer-tissue or of the living tissues, skin, spleen, liver, blood, or embryo of the same species. Injections of the dead and disintegrated tissues in the majority of cases lower immunity. This cancer-immunity proper gives rise to inability on the part of the connective tissues to supply the specific vascular scaffolding. No antibodies are formed, and the immunity is due, chiefly if not entirely, to alterations in the cells and individual tissues.

The other form of immunity concerns the inoculation of cancer from another species; here the immunity is not against the cancer as such, but against foreign proteins. In this case, at the seat of inoculation, a collection of granulation tissue

¹ Bashford, *Trans. Roy. Soc. Med. (Therapeutical Sect.)*, February 1, 1910, pp. 69 *et seq.*

forms in which is a small central cavity with the necrotic *débris* of the inoculated tumour tissue. Cytolysins are formed in the blood.

The immunity against foreign proteids, as against bacteria and their products, arises independently of the life or death of the organisms or cells; the reaction is produced only by heterologous tissues, not by those of animals in the same species, nor by those of the animal itself; and the reaction can be demonstrated in the test-tube. The immunity-reaction proper against cancer above described can only be studied in the living animal, and depends on the transference of living autologous or homologous tissues.

From a consideration of the theories of immunity Bashford concludes that the discovery of a heterologous cancer serum is not to be expected. The progress of knowledge hitherto offers no hope of success from the injection of killed cancer-cells, tumour-extracts, or vaccines from supposed cancer-parasites. Great prudence is necessary in the attempts at vaccine treatment of cancer which may easily produce anaphylaxis.

II. Local Methods.—Local methods of modifying favourably or attempting the cure of cancer have been sought in the application of various caustics either immediately or after curetting, in injections into the substance of the tumour, and in various physical agencies. Amongst the various caustics that have been employed may be mentioned strong solutions, up to 50 per cent, of chloride of zinc, fuming nitric acid, bromine in alcohol, and a paste of arsenic and cinnabar. Parenchymatous injections have been tried of the following among other agents: nitrate of silver solution, methylene-blue, alcohol, acetic acid, 6 per cent solution of salicylic acid in alcohol, sodium cinnamate, and trypsin. Among the physical agents may be enumerated, in addition to the therapeutic rays which will be treated separately, high-frequency electrical currents, diathermy, ionic applications, and the application of a certain degree of heat.

I have tested in practice a certain number of the methods of treatment hitherto enumerated, without perceiving any definite advantage. Methylene-blue injections gave rise to severe pain without any compensating favourable influence. Violet leaves failed in 2 cases, trypsin and chian turpentine in others; sodium coumarate in 6 cases had no discernible influence.

The history of most of the methods is strikingly similar. In nearly every instance the treatment has been at first claimed by its sponsor to be curative at least in a proportion of cases; usually it has appeared to exercise a remarkable selective action on the cancer-cells; and before it has fallen again into obscurity it has been lauded as giving great relief to symptoms, pain, bleeding, and discharge, even if it does not cure.

Treatment by X-Rays and Radium.—Soon after their discovery the X-rays were found to have a marked influence on certain superficial cancers, and appeared definitely to cure rodent ulcers. The introduction of radium in its turn placed a new and very powerful agent in the hands of fortunate owners, many of whom have made extensive observations on its use in the treatment of cancer, and have published their results, from a consideration of which it may fairly be concluded that the radium treatment of cancer is still on trial, and that its real efficacy cannot yet be pronounced upon with certainty.

The demand for radium for the treatment of cancer has been taken advantage of by speculators to raise the price enormously, and the consequent search for a cheaper source of Gamma-rays has unfortunately not been very successful. The results of the high price are unfortunately far-reaching. In an affection of uncertain and varying course and duration like cancer, the opinion of a person of large experience in the disease is alone of value in making the diagnosis and in estimating the result of any kind of treatment. The practice of radiology calls for a long and severe training in the use of the tools. An efficient and reliable investigation into the ray-treatment of uterine cancer can therefore only be carried out by a gynaecologist and a radiologist acting together, a condition not commonly fulfilled.

The problem in deeply-situated cancer like that of the uterus is to introduce large doses of effective rays without injuring the normal tissues. The most penetrating of the rays under consideration are the Gamma-rays of radium, and in uterine cancer only these and X-rays have been employed. Tuffier¹ has used both, and as the result of histological examinations claims for them a selective action on cancer-cells; the X-rays are inferior in penetrating power, reaching a depth of less than two millimetres, while the Gamma-rays penetrate at least two centimetres. The two agents, therefore, are not to be used indiscriminately.

The therapeutic rays have been employed in uterine as in other cancers with the hope of curing the disease, or at least of mitigating the symptoms. According to Tuffier the X-rays act as a haemostatic, promote cicatrization, and relieve pain, but leave the deeper portions of the growth intact. The Reports of the Radium Institute² speak enthusiastically of the use of radium. Of 104 cases of uterine cancer³ treated to a conclusion, 4 were apparently cured, 63 improved, 17 not improved, and 9 died, while 11 abandoned treatment. The local manifestations of the disease, fungating growth, ulceration, haemorrhage, discharge, and pain, are

¹ *Brit. Med. Journ.*, February 3, 1909.

² "Radium Institute," *Brit. Med. Journ.*, 1915, vol. i. p. 367.

³ Leading Article, *Brit. Med. Journ.*, 1915, vol. i. p. 381.

benefited in the most striking fashion. In favourable cases, growth and dissemination are retarded. Recurrent vaginal nodules after hysterectomy respond well to treatment, which must, however, be carried out with circumspection.

Cases have been recorded in which treatment by rest and rays has converted an apparently inoperable uterine cancer into an operable one. In such cases due allowance has to be made for the absorption of surrounding inflammatory exudation that often occurs after rest and cleansing of the ulcerating surface.

The use of X-rays after operation with a view to the prevention of recurrence has been recommended, and deserves patient investigation. The practice calls for circumspection and ample experience on the part of the radiologist. The weapon is powerful and double-edged. Not only may it attack, as desired, any malignant cells that may linger in the tissues, but it may injure or destroy the healing or the resisting powers of the normal cells and fluids.¹

The dangers of ray-treatment include burning and sloughing of the skin, of the intestinal wall, and of other normal tissues. Thrombosis of veins and haemorrhages have been seen in the neighbourhood of the uterus after treatment for cancer, and Bumm describes a case of hyperpyrexia (temperature 106° F.) after a very large dose of radium. The latter observer also has several times seen small burns caused by mesothorium in the posterior vaginal fornix, and in one case the formation of an abscess. The destructive action on normal tissues may begin as late as six or even twelve months after the applications; it is shown by fibrotic and hyaline degenerations which are not far removed from massive necrosis. Bumm has seen perforation of the bladder in two cases, and in another total necrosis of the uterus.

The results of ray-treatment in uterine cancer have often been discussed with more enthusiasm than discretion. In a considerable number of cases marked relief of symptoms for a longer or shorter time has followed this like many other forms of local treatment. Whether the therapeutic rays are superior to all other methods, or whether eclectic treatment is best, time and patient investigation can alone prove. Alleged cures by radium or X-rays must be tested by the same criteria as surgical cures. There must be reliable microscopical evidence that the disease was cancer to begin with; and examination at the end of five years must show that there are no physical signs of recurrence. When it has been thus proved that uterine cancer is curable in some cases, further research will show in what proportion of cases cure can be obtained, and whether this equals, or exceeds, the total curability by operation. Meanwhile surgery alone can claim solid practical achievement.

¹ R. Knox, *Lancet*, 1912, vol. ii. p. 753.

B. Symptomatic Treatment

In the middle stages of the disease, when the ulcerating tumour is too far advanced for radical removal and yet not so far as to threaten the integrity of the neighbouring important organs, the bladder and rectum, much relief can be afforded by patient and judicious perseverance in the use of medical and minor surgical measures. In the earlier stages of recurrence after operation similar means may also be employed with advantage.

The treatment, general and local, aims on the one hand at modifying the malignancy of the cancer, and on the other at increasing the patient's resistance to local extension as well as to generalization of the new growth. The most important practical indications in every case comprise the general medical management of the patient, and the correct surgical treatment of local ulceration and fungoid overgrowth; by attending to these, growth can be retarded and the symptoms ameliorated. Along with attention to these two indications, attempts to modify virulence and immunity may be made along the lines indicated in the last section, all of which are, however, still in the empirical or experimental stages. Later in the course of the disease, as it gradually passes into the terminal, cachectic stage, nothing more than the alleviation of symptoms can be expected, though even in this direction much may be achieved.

I. General Methods.—The general management of a case of cancer comprises attention to general hygienic and nursing details. The diet should be simple, varied, and easily digestible; as the case progresses the appetite becomes capricious, and the feeding of the patient calls for unbounded patience and ingenuity on the part of the attendants. It is probably best in the earlier stages of the affection for the food to be rather on the spare side; such a diet appears to diminish, whereas a generous and stimulating one increases, pain. The regular and easy evacuation of the bowels calls for special attention, not merely to avoid the harmful effects of constipation, but to prevent the increased pain often caused by the passage of hard scybala. The necessity of strict cleanliness of body and clothing need hardly be emphasized.

Alcohol is one of the most useful drugs, but requires careful watching. Strictly regulated doses of the lighter wines or beers often prove useful as a tonic or digestive. At bed-time a small dose of whisky or other spirit given in hot water or milk often acts usefully in soothing pain and promoting sleep. In larger and more frequent doses alcohol appears to increase the blood-supply of the tumour, and so to increase pain and hasten growth.

Rest, mental and bodily, are of extreme importance. The bodily rest should, as long as possible, be judiciously combined with light employment and gentle exercise in the open air. No doubt complete rest in bed from an early stage may prolong to some extent the duration of a case of cancer, but such prolongation appears to be dearly bought by the patient and her friends.

Along with attention to these indications a careful trial of some of the means already enumerated that appear reasonably likely to exert an influence on the patient's general condition should be made. At the worst such means often prove useful by helping to avert depression and hopelessness with their deleterious consequences.

II. Local Methods.—Treatment of the cancerous ulceration and overgrowth is of the utmost importance and should be persevered in as long as possible. By keeping down septic infection, the vascularity of the growth and of the pelvic contents generally is kept within bounds, and so pain, bleeding, and discharge are diminished, and the rapidity of extension of the new growth is retarded. The extension of the cancer deeply into the tissues is beyond the possibility of direct modification, but means are being sought to meet this indication, and may possibly prove to have been found in radium and its congeners.

The Treatment of Ulceration and Fungoid Overgrowth.—This is best carried out by scraping the friable tissue away to a firm foundation of tissue, and destroying the resulting surface by cautery and caustics. Obviously, care has to be taken in the selection of cases and in carrying out the method, or perforation of the bladder, rectum, or peritoneum may result. The method is not indicated in infiltrating tumours where the surface is unbroken, and is of little value when there is great invasion of the connective tissues with relatively little ulceration, or where the vagina is extensively involved. It is especially useful in cauliflower growths, except where these have broad infiltrated bases invading deeply the vaginal walls in front or behind. The method is also indicated in carcinomatous ulcers of the cervical canal and in corporeal cancer. In every doubtfully operable uterine cancer a careful examination under anaesthesia should be made, and if the case proves inoperable curetting and cauterization should follow.

Method.—Under anaesthesia, the patient is placed in the lithotomy position, and the vulva and vagina carefully cleansed with soap and water and with antiseptics. A careful examination by vaginal, rectal, and combined methods is then made, and an attempt made to determine the relations and condition of the bladder by catheter and cystoscope. The fungating friable tissue is next scraped away by sharp spoons down to a firm base, attention being continually given to proximity of bladder or

rectum. Loose tags of tissue in the edges of the ulcer, pieces of cervix or vaginal wall, may be cut away by knife or scissors. Surprisingly little bleeding attends this proceeding, and if any occurs it is, as a rule, easily controlled by pressure and waiting for a minute or two. In cases of internal uterine cancer the curette is similarly used to bring away all loose tissue, but in doing this especially in corporeal cases care must be taken lest the peritoneal cavity be opened; the risk of such a happening was well shown in the case illustrated in Fig. 290.

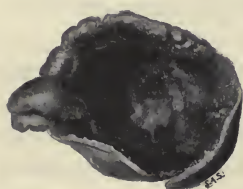


FIG. 292.—Slough from cancer of cervix twelve days after curetting and packing with strong zinc chloride solution. (Natural size.)

The resulting firm base of cancer-tissue may now be destroyed as far as feasible by the actual cautery, or may be attacked by caustics. Pacquelin's cautery or heated cautery-irons may be employed at a dull-red heat with the intention of producing a hard dry and deep slough. Care has to be taken to prevent burning of the vagina and vulva during this proceeding. The resulting cavity is packed with an antiseptic powder, such as boracic acid, or with iodoform or bismuth gauze.

If caustics are preferred, pure formalin or 50 per cent chloride of zinc solution may be used. I have tried both in many cases with apparent advantage. Small strips of lint are well squeezed out in the solution and the scraped cavity is filled with them. The vagina is protected by wool tampons well soaked in carbonate of soda or by wet glycerine tampons. Other caustics have been used but have appeared to me less useful, or less manageable, than those just mentioned; among them may be enumerated liquor ferri perchloridi, fuming nitric acid, carbolic acid, chromic acid, bromine in alcohol, and caustic potash.

The after-treatment is simple. A sedative is sometimes required in the first few hours. Every other day the vagina is wiped out through a speculum with carbolic or sublimate solution, it is then dried, and the ulcer and fornices painted with strong iodine solution. This dry method of treatment has appeared to give decidedly better results than vaginal douching. The resulting slough (Fig. 292) usually comes away on the tenth to the fourteenth day, leaving a red granulating surface which in an occasional favourable case may completely heal; usually it contracts to a considerable extent. In not a few cases the area of surrounding induration notably shrinks in the course of three or four weeks, and a cancer that appeared widespread and fixed may become movable and operable.

Subsequent treatment should be directed to keeping the surface of the ulcer as clean as possible. The methods of so doing may be divided into dry and wet

The latter methods consist in the use of cleansing douches of various antiseptics, deodorants, or astringents; they have appeared to me to be decidedly inferior to the dry methods. These are more troublesome but the results appear to repay the extra care. Through a speculum an application to the raw surface is made of some selected strong antiseptic. I have tried strong iodine solution once or twice a week and acetone once weekly, each with advantage. The latter has done good service but is somewhat more troublesome. The patient lies on the back with the pelvis well raised on pillows; through a Ferguson's speculum 3 or 4 drachms of pure acetone are poured into the vagina, and left to act for three or four minutes. The fluid is then carefully soaked up by absorbent wool and a glycerine tampon introduced to be withdrawn in twenty-four hours. Care has to be taken to prevent the acetone escaping on to the skin of the vulva or perineum, where it causes severe burning pain. Acetone penetrates the tissues to a certain depth and has a powerful antiseptic action; in many cases I have found it keep clean for several months a cancerous ulcer that had been scraped and cauterized. The advantage is obvious, though it must be admitted that the infiltration of the cancer into the deeper tissues does not seem to have been interfered with. Strong iodine solutions are also conspicuously useful and may be applied with a brush or a wool mop through a Ferguson's speculum every three or four days.

The Treatment of Haemorrhage and Discharge.—These symptoms are best treated by the methods just described for ulceration in those cases that are not too far advanced. If desirable the curetting and cauterization can sometimes be repeated after an interval of a few weeks or months. When the lesion is too far advanced, or where the patient refuses to take an anaesthetic, various less effectual methods are available. The ulcerating cavity may be packed every three or four days with a small gauze bag containing astringent or haemostatic powders, such as tannin and boric acid; or with gauze soaked in adrenalin, perchloride of iron solution, acetic acid, oil of turpentine, or other astringent. Copious hot douches at a temperature of 115° to 120° F. may be employed with the addition of an astringent such as sulphate or chloride of zinc, alum, or formalin, or of an antiseptic or deodorant such as permanganate of potash, sanitas, creolin, izal, or weak solution of carbolic acid or corrosive sublimate. Injections of peroxide of hydrogen in 3 to 5 per cent strength are also useful.

The Treatment of Pain.—In meeting this indication it is necessary always to bear in mind that the course of the case may be prolonged, and that every remedy loses its effect after a time. The milder and simpler means are therefore to be exhausted before recourse is had to the stronger narcotics. The effective treatment

of the cancerous ulcer on the lines already indicated has a marked influence in the middle stages of the disease, when the pain is often increased by inflammation due to sepsis. Where the pain is due to infiltration of the tissues and to pressure on the large nerves and other important structures, the X-rays or radium are often very beneficial.

In the earlier stages heat, applied by means of fomentations or a hot-water bottle, turpentine stupes or a linseed and mustard poultice, is often helpful. Sometimes applications to the ulcer of eucaine or cocaine ointment, or the same agents in solution with or without adrenalin relieve pain. When such means fail the milder sedatives, such as antipyrin, phenacetin, or aspirin; or the diffusible stimulants, such as ammonia, ether, or alcohol in various forms, may be employed.

As the pain becomes more severe recourse is usually necessary to opium and its derivations, codeine in increasing doses, omnopon, pantopon, and morphia. These should be administered at first by the mouth, later by rectal suppository, and finally by hypodermic injection. When the pain is severe these drugs have to be given in increasing doses, and when in a long-standing case the efficacy is lost, even when very large doses are used, the problem of relief of pain becomes difficult of solution. In such a case lumbar injection of stovaine was employed by H. Freund with good effect, pain that was previously not influenced by morphia or aspirin afterwards being relieved by these drugs.

C. Prophylactic Treatment of Uterine Cancer

More knowledge is required before the formulation of rules for the prevention of cancer. In the meantime, since it appears at least probable that certain conditions of erosion and eversion predispose to the occurrence of cancer, it is desirable that more extended and minute investigations should be made, and that these conditions should be treated seriously, especially when they persist for many years after the last pregnancy. It seems possible, too, that the investigation and treatment of endometritis, persisting after the menopause, may aid in prophylaxis.

Moreover, inasmuch as it appears certain that in an occasional case contagion takes place from one person to another, and as we are ignorant of the circumstances under which this may occur, wisdom dictates that care should be taken to destroy the discharges from a cancerous ulcer; to disinfect or destroy the clothing, bedding, and utensils used by a patient suffering from cancer; and to disinfect the dwelling after the end of such a case. Further and more exact knowledge may prove such precautions to be unnecessary or futile, but meanwhile nothing but good can result from their employment.

PART VI

THE TERMINAL STAGES OF UTERINE CANCER

Cancer of the uterus, as it progresses, invades the whole organ and the surrounding connective tissues, so that after a time the whole contents of the pelvic cavity appear on vaginal examination to be converted into a hard fixed mass. Along with the peripheral extension ulceration and sloughing take place, especially in the oldest portion of the new growth, so that in the middle of the hardness is formed a large, irregular, deep, conical, or crater-like ulcer, from the surface of which in some cases

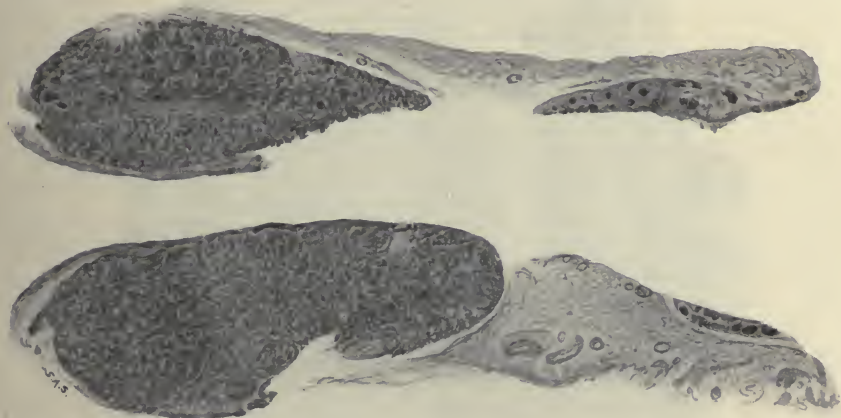


FIG. 293.—Surface-metastasis of peritoneum, from an advanced case of cervical cancer. ($\times 8$.)

a large friable mass of growth projects into the vagina. The proportion between new formation and destruction varies much in different cases; in one instance a great mass of solid tissue is found with comparatively little breaking-down; in another is a large irregular ulcer with relatively little new growth in its base; and between these two extremes every gradation is found.

As the destruction of tissue proceeds the whole cervix, and sometimes the whole uterus, may be eaten away, the base of the ulcer being then formed by infiltrated connective tissue. The body of the uterus becomes infiltrated by way of the lymphatics in the muscular wall, or less commonly by spreading along the mucous membrane transcending the os and spreading over the whole endometrium. The whole thickness of the wall becomes infiltrated, the growth involving the peritoneum,

in which case adhesions commonly form to contiguous organs and tissues, especially to omentum and intestine. In rare cases diffuse carcinomatous invasion of the peritoneum takes place (Fig. 293). Septic peritonitis is occasionally set up, usually from the perforation of an abscess or putrid collection, or from the rupture of a

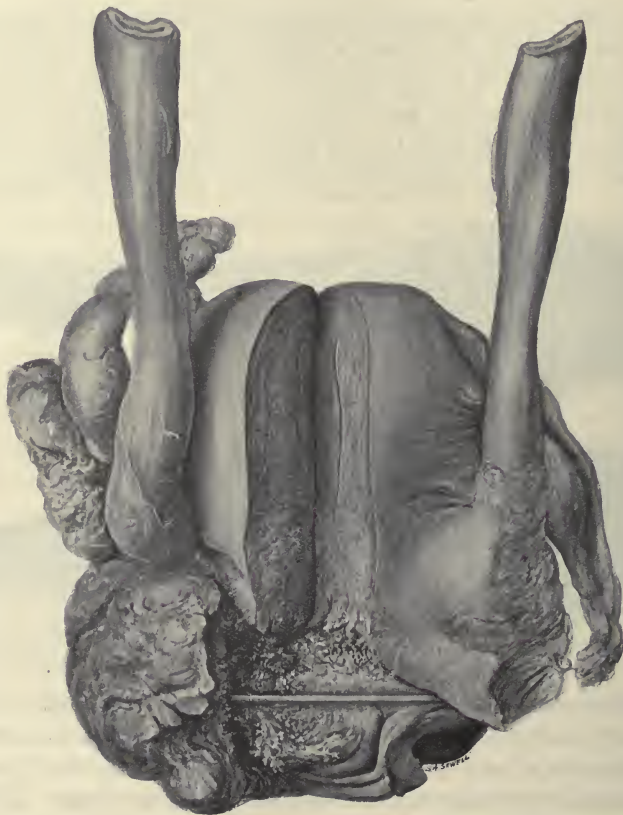


FIG. 294.—*Post-mortem* specimen of a malignant ulcerating tumour of the cervix, obstructing the ureters, and causing death from suppression of urine.

pyosalpinx. The connective tissue at the base of the broad ligaments becomes thickened and hard, as if injected with plaster of Paris, either uniformly, or, more frequently, in a nodular and irregular fashion, due to the fusion of discrete secondary foci. As the infiltration proceeds, the ureters, in their passage through the connective tissue at the bases of the broad ligaments, become surrounded and pressed upon, or

have their walls invaded by lymphatic extension of the growth. Consecutive dilatation of the ureters and of the pelvis of the kidneys then takes place (Fig. 294).

Extension often takes place from the cervix along the whole length of the vagina, which is converted into a rigid tube opening at its upper end into an irregular ragged ulcer. The spread along the anterior vaginal wall often invades the base



FIG. 295.—Malignant ulcer of the cervix which has infiltrated the anterior wall of the vagina and base of bladder. The ureters pass through lobulated masses of growth, and an irregular fistulous opening has formed a little behind the trigone. The pointer is in the uterine cavity.

of the bladder, where large nodules of growth may be formed, here again not uncommonly involving the ureters (Fig. 295). The invasion of the utero-sacral ligaments forms a hard ring round the rectum, causing interference with peristaltic action and corresponding difficulty in the action of the bowels.

In the later stages of the disease ulceration may involve the base of the bladder, or occasionally, the walls of the ureters, giving rise to urinary fistulae. Less commonly, the ulceration spreads through the wall of the rectum giving rise to recto-vaginal fistulae. Thus, in some cases, the interior of the growth becomes broken down into

a large irregular cloacal cavity through which both bladder and rectum discharge their contents.

The lymphatic glands in many cases are affected at a comparatively early stage of the disease, sometimes even before the ligaments are involved. The enlargement in the earlier stages is about as frequently due to simple irritation as to infection by the new growth; even in the last stages of the disease the glands are often said to remain free. The glands first affected in cancer of the cervix are, as a rule, those situated along the external iliac vessels, and in the angle between these and the internal iliac. When the disease begins in the body of the organ, the lumbar glands are first invaded, later, the same glands as in the cervical cases, and finally, in some cases, the upper internal inguinal glands become involved.

In the later stages of the disease the invasion of the connective tissue spreads to the vascular sheaths, and thrombosis of some of the larger arteries and veins is not uncommon. The most frequent site of thrombosis is in the external iliac vessels where the affection gives rise to great oedema of the corresponding leg, an oedema that may persist until death, but which sometimes diminishes with the development of a collateral circulation. Oedema may also affect the vulva and the lower abdominal wall. Obstruction to the pelvic circulation, in some cases, also gives rise to bleeding from the hæmorrhoidal veins.

When the growth involves the larger nerves of the sacro-sciatic plexus or the obturator nerve, persistent and often agonizing pains are caused which radiate along the course of distribution of the trunk involved.

Symptoms.—In the terminal stages the symptoms thus become aggravated by a complexity of lesions. The tumour, as it increases in size, infiltrates or compresses the neighbouring important organs and tissues, viz. the bladder, ureters, rectum, the large blood-vessels and nerves, and the peritoneum. In the interior of the growth progressive ulceration and sloughing occur from interference with the blood-supply, and from invasion by many varieties of germs, pyogenic and saprophytic; hence arise irregular and profuse hæmorrhages and continuous irritating and exhausting discharges usually of intense and disgusting foetor.

In the more advanced stages, and especially when the connective tissues have been invaded, pain becomes more severe, and when the infiltration extends up to the walls of the pelvis, fixing the floor, the suffering is apt to be intense and persistent. The pain is then described as aching, boring, burning, stabbing, screwing; and is continuous night and day, it is not relieved by rest, and commonly is said to be worse in bed. When septic invasion of the growth takes place, leading to inflammation, ulceration, and sloughing, pain becomes greatly aggravated, and in many

instances these processes appear to be the chief, if not the only, cause of pain. When the infiltration involves the large nerves the pain often becomes agonizing. Sometimes a period of more or less prolonged and continued suffering is followed by one of comparative ease and freedom from pain; the reason for such a change is not obvious, but is apparently due, in some cases, to diminution of inflammation surrounding the new growth, to the separation of a considerable slough, or to the complete functional destruction of a large nerve. When the growth approaches the peritoneum the irritation of this membrane gives rise to pain, tenderness, and tympanites, and to a protective contraction of the flat abdominal muscles, which causes the abdominal wall to become hard and board-like. In the last stages of the disease, when pressure on the ureters has led to marked interference with the renal functions and consequent dulling of the consciousness, the pains become much more tolerable.

As the bladder becomes invaded micturition becomes more painful and frequent; pus, and in some cases blood, appear in the urine. Towards the end a vesico-vaginal fistula forms in nearly one-third of the cases, and the constant discharge of ammoniacal urine, added to the irritating putrid discharge from the ulcerating tumour, increases the irritation of the skin of the vulva and contiguous surfaces of the thighs and perineum, giving rise to erythema and dermatitis, and often causing intense and persistent pruritus.

The pressure on the ureters and consequent hydronephrosis predispose to infection of the urinary tract and so to suppurative pyelonephritis. The urine becomes watery and purulent, and the excretion of urea and other nitrogenous waste products is diminished. Complete suppression of urine is not uncommon in the closing stages. Chronic uraemic symptoms develop, including headache and vomiting, mental dulness, stupor and somnolence, and occasionally, general oedema. Finally, convulsions and coma may supervene.

As the cancer approaches the rectum pain in defaecation begins, and is aggravated by constipation, which in turn increases the pain. Sometimes there are attacks of diarrhoea or tenesmus accompanied by the passage of mucus or blood. In nearly one-sixth of the cases a recto-vaginal fistula is formed in the last stages, and faecal matter is added to the other vaginal discharges.

Cachexia.—Together with the development of the late symptoms, the general condition of the patient undergoes marked and rapid deterioration and the characteristic cancerous cachexia develops. It cannot be too strongly emphasized that this condition is a late development and marks the terminal stage of uterine cancer. At this time the clinical picture is one that he who runs may read. The gait and attitude of the patient, with body bent forward on the hips, and slow, painful, and

stiff steps, arrest the attention. The pallor and dull muddy hue of the complexion, the drawn features and look of suffering, the dry skin and wasted hair, the marked emaciation and obvious debility, the whining voice, and readiness to undergo any treatment that may be suggested, all go to make up a picture that once seen can never be forgotten. Fortunately most of the patients die without filling in all the details.

There is usually no pyrexia, or only slight and irregular elevations of temperature, even when ulceration is far advanced. In some cases a rise to 100° F. in the evenings alternates with a normal or subnormal morning temperature.

Changes in the blood are not discernible in the earlier stages of cancer. With the onset of cachexia deterioration sets in, progressive hydraemia, diminution in the number of red blood-corpuscles, in the percentage of albumen, and in the specific gravity. In most cases there is leucocytosis.

The cachexia is not a direct result of the cancer itself. A large malignant tumour of the uterus may develop without notable local or general symptoms. Only when some accident happens, such as haemorrhage into its substance, ulceration or sloughing, do the local symptoms of loss of blood and other discharges become pronounced, and only then does the general condition rapidly deteriorate. The cachexia depends upon the drain of nutritive fluids, blood, and serum, on the effects of septic absorption and invasion, on the exhausting effect of continued severe pain, and on the depressing effects of all these causes on the appetite and digestion, and on the nervous system with consequent loss of sleep. Interference with the rectum and with the urinary organs aggravates the condition.

Latent Cases.—In certain cases cancer of the uterus may give rise to no symptoms, or at least to none that arouse the patient's attention until the disease has become very far advanced, or even fatal. Roger Williams¹ refers to 3 such cases; in one, cancer of the cervix, with infiltration of the ureters and renal atrophy, appeared clinically as chronic nephritis; in a second, cancer of the uterine body with peritoneal dissemination, was diagnosed during life as cirrhosis of the liver; in the third, amputation at the shoulder-joint was performed for a growth in the humerus which was mistaken for primary sarcoma, but which was really metastatic from a cervical cancer.

Recently I was asked to see a patient with well-marked cancerous cachexia in whom the breast had been amputated for a localized mammary cancer, not attended by glandular infiltration. During convalescence from the operation a vaginal discharge was noted which the patient declared had only been present for about two months. The pelvic cavity was filled by a large cervical cancer which

¹ *Loc. cit.* p. 298.

extended in all directions up to the walls of the pelvis, and had an irregular ulcerated crater in the interior. The uterine condition was the obvious source of the cachexia.

Spontaneous Recovery.—Many instances of spontaneous recovery from breast-cancer have been recorded. In uterine cancer this phenomenon is rare, but not impossible. Prolonged freedom from recurrence following curetting has occasionally been reported, but may of course be due to the complete removal of the growth. Hess¹ records a case of corporeal cancer proved by curetting, in which the patient remained free from symptoms for four years; the sister of the patient had died of cancer after a radical operation. Van Hanseemann in the same journal refers to two other similar cases.

Causes of Death.—In many cases the patient dies from gradual exhaustion, worn out by the continued pain, bleedings, and discharges. Seldom is the fatal issue due to sudden or profuse haemorrhage. Often the final catastrophe is precipitated by some bacterial infection giving rise to pneumonia, pleurisy, bronchitis, or some such pulmonary disease. In several of my cases peritonitis, septic or cancerous, general septicaemia and pyaemia were the causes of death. Occasionally pulmonary embolism occurs. In a large proportion, probably the majority of cases, uraemia is the effective, or an important contributory cause of the fatal issue. Total suppression of urine is not rare. General uraemic convulsions are not uncommon; coma and oedema of the lungs frequently close the scene.

Duration.—The duration of cancer of the cervix cannot be estimated because there are no recognizable symptoms until the disease has already attained a more or less advanced stage. Reckoned from the beginning of obvious symptoms, the duration has been described as varying from four or six months to four or five years; the average arrived at being usually stated at from sixteen to twenty months. Leitch found the average duration in 900 cases to be one year and nine months. In 16 cases from my own note-books the duration varied between five months and three years, the average working out at one year and eight months.

Not a few cases last for a much longer time. One of my patients lived for more than eight years after the discovery of a cancer of the cervix; and I have known another case lasting seven years. Kamperman² relates a case of basal-celled carcinoma of the cervix under observation for fifteen years, and another patient was alive and fairly well six years after being seen with inoperable squamous-celled carcinoma of the cervix.

¹ Hess, *Deutsche med. Wochenschr.*, May 29, 1913.

² Kamperman, *Amer. Journ. Obstet.*, 1912, vol. lxvi. p. 596.

Metastases.—In 43 necropsies on cases of recurrence after operation, Winter found not a single case of metastasis in the internal organs. In fatal cases of uterine cancer, metastases in the internal organs are by no means common. In one of my cases, dying after Caesarean section, there were numerous secondary growths in the liver and over the surfaces of each lung; and a large one penetrated along the main bronchus into the right lung. These two organs are the most frequent seat of metastases. Blau found the liver invaded in 9 per cent, the lungs in 7, and the kidneys in 3·5 per cent of cases that ran their course. Albers-Schönberg¹ in 564 necropsies found secondary growths in the liver in 13·8 per cent, and in the heart in 4 cases, or 0·7 per cent. Roger Williams² in 79 *post-mortem* examinations found systemic dissemination in 16, or 20·2 per cent.

Metastases from uterine cancer may develop in any part of the central or peripheral nervous system including the meninges, but they are comparatively rare, and according to Offergeld³ only 30 such cases have been reported. In 6650 cases reported by six other authors there were only three instances. In the brain the secondary growth may appear relatively early, and is usually associated with secondary growths elsewhere, especially in the liver and in the lungs. The cerebral growths are usually solitary, rarely as large as a hen's egg, and as a rule give rise to no clinical symptoms. Multiple tumours of the meninges without clinical symptoms have been observed, mostly in inoperable cases; metastases of the peripheral nerves, especially in the pelvis, are probably more common than has been suspected.

Secondary Uterine Cancer.—The uterus may be affected secondarily by cancer originating in other organs or tissues. Most commonly the secondary invasion takes place by direct extension from cancer of the rectum, sigmoid, ovary, Fallopian tube, vagina, or bladder; or metastases, often multiple, arise in the peritoneal coat of the organ from cancer in the upper part of the abdominal cavity, of the stomach, pancreas, intestine, or gall-bladder. The seat of the primary tumour is not uncommonly in the mammary glands. In 167 *post-mortem* examinations of cases of breast-cancer Roger Williams⁴ found metastases in the uterus in 3 per cent, almost invariably beginning in the peritoneal covering of the body of the organ, and usually multiple. In very rare cases nodular metastases of breast-cancer are met with in the cervix.

Euthanasia.—In the last stages of uterine cancer efforts require to be directed to making the conditions as bearable as possible to the patient and her surroundings

¹ Albers-Schönberg, *Centralblatt für Gynäkologie*, 1896, p. 1001.

² Roger Williams, *loc. cit.* p. 228.

³ Offergeld, *Amer. Journ. Med. Sci.*, 1909, xxxvii. p. 774.

⁴ Roger Williams, *loc. cit.* p. 237.

and to the promotion of euthanasia. In the latter task Nature often mercifully assists by way of the remote effects of pressure on the ureters, which dull the patient's consciousness to suffering.

The foul-smelling discharges cannot now be cured, but alleviation may be sought in the use of copious douches of warm salt solution, or of some of the milder antiseptics and deodorants, such as permanganate of potash, boric acid, sanitas, or izar in weak solutions. The vulvitis and dermatitis may be helped by careful cleansing with non-irritating detergents such as weak borax and soda solution or oatmeal gruel, followed by the application of a thick layer of vaseline or of lanoline and olive oil, and by the occasional use of a mercurial or carbolic solution. Large fomentations of chlorine water to the vulva and thighs, frequently changed, have been recommended. Great care in nursing is necessary to prevent the formation of bed-sores. Pain, and frequency of micturition may be alleviated by the usual methods of diluents and urinary sedatives. Where retention of urine has been caused by extension of growth to, or metastases in, the urethra, suprapubic cystotomy may be indicated, as in a case published by Caddy.¹

The utmost patience is needed in trying to nourish the patient; the capricious appetite, weak digestive powers, and frequent nausea or vomiting call for easily digestible foods in small quantities at frequent intervals.

The pain and general distress are best met at this stage by the administration of morphia hypodermically or in rectal suppositories, often advantageously aided by the use of diffusible stimulants, especially alcohol in its various forms.

¹ *Lancet*, 1891, vol. ii. p. 1163.

CHORIONEPITHELIOMA MALIGNUM

By Professor JOHN H. TEACHER
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THE subject will be considered under the following headings :

I. Introduction. II. History. III. Morbid Anatomy. IV. Histology. V. Clinical Features. VI. Etiology. VII. Incidence. VIII. Diagnosis. IX. General Course and Termination : Prognosis. X. Treatment.

I. Introduction.—*Chorionepithelioma malignum* is a malignant tumour of the uterus originating in connection, sometimes immediate but frequently remote, with a confinement or an abortion. The connection with pregnancy is essential, for the tumour is a special growth originating from the epithelium of the villi of the placenta—the chorionic epithelium. Clinically it is characterized by an occurrence, within a shorter or longer period after pregnancy, of irregularly recurring, often violent, haemorrhages, progressive anaemia, cachexia, and sometimes fever with rigors. In many cases it destroys life with a rapidity almost unequalled by any other kind of growth. The morbid anatomy shows a haemorrhagic, friable tumour, situated most commonly in the cavity of the uterus, occupying the fundus and adjacent portions of the anterior and posterior walls, that is, the usual site of the placenta. On interference with it bleeding occurs, and is apt to be very profuse. Histologically it presents a characteristic picture, which, at the same time, is complex and rather confusing, owing to the large variety of cell-forms which may be seen.

The typical elements are :

(1) Large multinucleated irregular masses of protoplasm (the plasmodium or syncytium), in which no definite cell-boundaries are recognizable, corresponding to the syncytial layer of the chorionic epithelium.

(2) Small well-defined polyhedral cells with large vesicular nuclei, packed together in masses, without any connective-tissue stroma between them, which represent the cell-layer (layer of Langhans) of the chorionic epithelium.

(3) Mononucleate or multinucleate cells of all shapes and sizes, which, in some cases, form a great part of the cell-masses, and are also found infiltrating and destroying the adjacent tissues after the manner of sarcoma. These also are elements of the chorionic epithelium.

Among the cell-masses are seen the remains of the normal tissues together with a large amount of blood, sometimes clotted, sometimes fluid, which gives the tumour its haemorrhagic appearance. The growth has no blood-vessels of its own, and no proper connective-tissue stroma. The adjacent normal tissues may show a reaction as around other tumours; but it is apt to be slight, and, on the other hand, a particularly active destruction of all normal tissues, and especially of the walls of the uterine blood-vessels, leading to haemorrhage, is characteristic of this tumour. The epithelial cells surround and destroy, and eventually grow into, the uterine veins, where, in the first place, the blood does not coagulate, so that it may be said that the tumour grows within the maternal vessels. To this feature it owes its tendency to dissemination by the blood-stream.

Chorionepithelioma is a particularly interesting tumour both pathologically and from its embryonic relationships. It is also important from the practical point of view, because it is by no means the great rarity that it was at first supposed to be. From 1889, when it was first recognized as a distinct variety of tumour, till 1903, nearly 200 cases were published, and in 1907 a reviewer in the *Zentralblatt für Gynäkologie* reckoned the number of known cases at 700. In the period of eighteen months from February 1901 to August 1902, 7 specimens, all from fatal cases, were added to the Museum of the General Hospital in Vienna, and several others were simply examined and then thrown out. In the period above mentioned about 2700 *post-mortem* examinations were made in connection with the General Hospital in that city. Even 7 deaths in that number is no inconsiderable proportion for a disease which was supposed to be rare, and, when one considers that most of the victims were women in the prime of life who had enjoyed good health up to the fatal pregnancy, the importance of the disease is apparent. We are aware of 18 cases in Glasgow between 1898 and 1914, only 6 of which did not prove fatal. Possibly other cases have escaped recognition, passing for retained placenta with septic infection or for sarcoma of the uterus.

At the same time, evidence is not wanting that chorionepithelioma has sometimes been erroneously diagnosed, and that operations have been too hastily performed. The extreme malignancy of the first reported cases gave grounds for the opinion that radical operation should be performed at once in all suspicious cases; but further experience has shown that the extremely malignant form is but one type,

and that all degrees of malignancy may be met with, just as in the other classes of tumour. The histological test has been proved to be by no means infallible, and, neither clinically nor pathologically is it possible to draw a sharp line of distinction between cases of retained placenta or simple hydatidiform mole, which are curable by the removal of the foreign material, and those which run on into chorionepithelioma or destructive hydatidiform mole. It is especially with regard to the last-mentioned variety of the tumour that difficulties are met. The recognition of chorionic epithelium or chorionic villi is easy and certain, but it is a very different matter to decide whether the tissues are those of a simple hydatidiform mole, or those of a potential malignant growth.

II. History.—The evolution of the present view of the nature of chorionepithelioma may be briefly traced. The history of chorionepithelioma begins with the description by Sanger,¹ in 1889, of a case of very malignant sarcoma-like growth of the body of the uterus, arising after an abortion in the eighth week. This he regarded, not as a sarcoma coinciding with the pregnancy, but as a special tumour allied to sarcoma, in the causation of which pregnancy was an essential feature; in other words, a growth developed from a tissue peculiar to the gravid uterus, which he believed to be the decidua, and he called the tumour “deciduoma malignum.” In 1890 Pfeiffer²—a pupil of Chiari—published an account of a very peculiar growth, and classed along with it three cases which had been described by Chiari³ in 1877 as carcinoma of the uterus coinciding with pregnancy. Pfeiffer quite independently came to the same conclusion as Sanger, and also called the growth deciduoma malignum. Pestalozza,⁴ in 1891, reported from Italy two cases of a highly malignant sarcoma-like tumour of the uterus connected with pregnancy, and also a third case which was a malignant hydatidiform mole with metastatic tumours in the lungs and vagina. In the last case Pestalozza recognized and pointed out that placental tissues were capable of giving rise to a tumour, malignant both locally and generally. Cases similar to that of Sanger were also reported by Schmorl⁵ and others, who did not altogether accept Sanger’s interpretation of the disease. Various other views were advanced, and the confusion as to its true nature became extreme. Most people regarded it as sarcoma of the uterus.

In 1893 Sanger⁶ published a monograph on the subject in which he discussed the pathology of the condition with reference to all the published cases, and, while recognizing the presence of placental tissue in some of the tumours, he adhered to his

¹ Sanger (a) *Zent. fur Gyn.*, 1889, p. 132; (b) *Verhandlungen der deutschen Ges. f. Gyn.*, 1892, iv. p. 333.

² Pfeiffer, cited from Marchand.

³ Chiari, cited from Marchand.

⁴ Pestalozza, *Il Morgagni*, Sept. and Oct. 1891, xxxiii. pt. 9.

⁵ Schmorl, *Centralbl. f. Gyn.*, 1893, p. 169.

⁶ Sanger, *Arch. f. Gyn.*, 1893, vol. xlix. p. 89.

original opinion that the decidual cells were the essential malignant element. His interpretation of the pathology of the condition was erroneous in many respects, but to him belongs the merit of first focussing attention upon the disease.

In 1895 L. Fraenkel¹ reported a case under the title 'syncytioma malignum' or carcinoma syncytiale, and argued that the tumour arose, not from decidua, but from the syncytial layer of the chorionic epithelium, and Whitridge Williams² independently recognized the connection of *deciduoma malignum* with the chorionic epithelium, and pointed out that elements resembling the cells of Langhans' layer were also present.

In the same year Marchand³ published the papers which brought order out of chaos. According to his view the growth was composed of cells derived from both layers of the chorionic epithelium; it was therefore—accepting the then prevailing opinion that the syncytium was derived from the uterine epithelium, and Langhans' layer from the foetal epiblast—of combined maternal and foetal origin. The difficulty of admitting that a tumour could be composed of both foetal and maternal tissues was fully met by the conception of the chorionic epithelium as so specialized a structure, and the symbiosis of its two elements as so characteristic and essential a feature, that they were entitled to be considered together as one tissue. It was on this ground, as well as on the grounds of the clinical history and histological structure, that Marchand regarded this growth as neither carcinoma nor sarcoma, but as a tumour *sui generis*. The difficulty has been met by the demonstration in recent years of the foetal nature of both layers of the chorionic epithelium.

Marchand's theory of the nature and origin of the tumour was founded on a thorough investigation of the histology of the human placenta. He was able to trace a close resemblance, physiological and anatomical, between the chorionic epithelium and the tissues composing the tumour. The frequency with which hydatidiform disease of the chorion precedes deciduoma had been previously noted, and had been held by some observers to be no accident. In the study of hydatidiform mole *in situ* within the cavity of the uterus, Marchand demonstrated that the generally accepted view of Virchow—that hydatidiform mole was a myxoma of the chorion—was erroneous. The stroma of normal villi consists of connective tissue, and, in the young placenta, it has the characters of embryonic connective or mucous tissue. In the mole Marchand found that the oedematous condition of this tissue was due to degeneration and liquefaction. In the small vesicles (the early stage)

¹ L. Fraenkel, *Arch. f. Gyn.*, 1895, Bd. xlviii. p. 80.

² Williams, *Johns Hopkins Hospital Reports*, 1895, vol. iv. No. 9. Deals with the older literature of deciduoma very fully.

³ Marchand, *Monatsschr. f. Geb. u. Gyn.*, 1895, vol. i. pp. 419 and 513; and *Zeitschr. f. Geb. u. Gyn.*, 1895, vol. xxxii. p. 405, "Bau der Blasenmole."

there was much mucin, as was natural considering the nature of this tissue; but in the large vesicles there was very little, their contents being a watery fluid. There was no active proliferation of the connective tissue, which was poor in nuclei, and reduced to a thin rind lying beneath the epithelium. But there was excessive and irregular proliferation of both layers of the chorionic epithelium, and this Marchand regarded as the important change. Later observers have, in the main, agreed with him. The condition may vary somewhat, and in some cases there may be excessive proliferation as well as degeneration of the mesoblastic cores of the villi; but the important tissue with regard to tumour formation is the epithelium.

Besides setting the histology of the hydatidiform mole on a satisfactory basis, Marchand was able to trace an extremely close likeness between the hypertrophied epithelium in the mole, and the cell-elements of *deciduoma malignum*. Not only were the cells which arose out of it the same in form, but they infiltrated the maternal tissues, and invaded the blood-vessels in a similar manner. This he showed, further, was but an exaggeration of the conditions found in the young placenta around the attachments of the villi to the decidua. His conclusion was that no sharp line could be drawn histologically between the long-ago-observed, but rare, malignant hydatidiform moles and deciduoma. In both diseases the active element is the chorionic epithelium, which takes on an excessive and aberrant growth, after the manner of the epithelial structures in carcinoma. Unfortunately, he was also forced to consider it impossible to distinguish sharply between the epithelial proliferation in a simple mole and that in a malignant one: this conclusion still holds good.

According to the view of Marchand, then, the so-called *deciduoma malignum* or, as he called it in his monograph of 1898,¹ *chorionepithelioma malignum*, may be regarded as a member of a series of diseased conditions of the chorionic epithelium, which shows many varieties, and a progression in degree of malignancy comparable with the progression from simple adenoma to malignant adenoma or carcinoma.

The actual diseased conditions of the placenta may be accordingly classified as follows:

(1) The simple hydatidiform or vesicular mole, which may be a dangerous disease apart from any actual malignancy.

(2) Malignant, perforating, or destructive hydatidiform moles, which differ little from the preceding in their structure, but in which there are a little more overgrowth of the epithelium, infiltration of the decidua and invasion of vessels, and the establishment of metastatic growths. In the combination of essentially malignant

¹ Marchand, *Zeitschr. f. Geb. u. Gyn.*, 1898, vol. xxxix. H. ii. p. 173.

epithelium with a stroma which may show growth but no malignancy, they may be compared with malignant papilloma.

(3) The pure chorionepithelioma, in which no trace of foetal mesoblastic tissue is to be found.

(4) Connecting the two latter, tumours composed almost entirely of epithelial tissue, in which a few villi, usually with hypertrophied and irregular epithelium, are seen.

The tumours of the last class are the crucial ones in which the whole of the tumour-tissue, with all its varied cell-forms, can be traced directly to its source. This had been recognized by Pestalozza in 1891, and was fully worked out in 1896 by Apfelstedt and Aschoff¹ and by Julius Neumann² independently. In their papers several cases of characteristic *deciduoma malignum* were described, in which villi were present, and in which the origin in them of the tumour-tissue was readily traceable. There is no better example of the demonstration of the relations of a tumour to its physiological prototype.

III. Morbid Anatomy.—The commonest site of the primary tumour is the wall of the uterus, but a considerable number of cases have been recorded in which that organ was quite sound and the primary tumour was situated elsewhere. The majority of the extra-uterine growths are situated in the vagina: two or three labial, more than a dozen tubal,³ or possibly ovarian, cases have been recorded; in several cases the primary growth was interstitial (*i.e.* the growth was embedded in the uterine muscle, apart from, and not in communication with, the cavity), and in two cases the seat of it could not be precisely determined.

Commonly, the uterus is enlarged to about the size of the organ at the end of the third month of pregnancy. There may be no sign of tumour externally: a few fibrous adhesions are sometimes found; or, if deep ulceration or the formation of detached nodules or deep outrunners of the tumour has occurred, the surface of the organ may show rounded prominences in which a dull-red colour shines through the normal greyish-pink of the muscle. The uterine cavity is found to be enlarged as by the presence of an ovum. On incision the muscle contracts strongly, throwing into prominence the contained growth (Fig. 296). This is a rounded solid mass, of varying size, composed of old, firm, dull-red blood-clot intersected by paler strands which consist of fibrin, or of uterine or tumour tissues in a more or less necrotic condition. Nearly the whole of the mass is of this nature, the active tumour-tissue forming only a thin irregular layer between the clots and the uterine muscle.

¹ Apfelstedt and Aschoff, *Arch. f. Gyn.* Bd. 1. p. 511.

² Neumann, *Wiener klin. Wochenschr.*, 1896, No. 36, p. 814.

³ See also *New Growths of the Fallopian Tube* (pp. 739-742).—EDITORS.

The tumour presents a considerable resemblance to a fleshy mole, and the histories of many cases suggest that such masses may sometimes be expelled and regarded as fleshy moles. If the mass be putrid, as is sometimes the case, it may be mistaken *in situ* for a sloughing myoma. The base of the tumour is broad, and covers a varying amount of the fundus and upper parts of the anterior and posterior walls of the cavity, corresponding to the common sites of the placenta. The lower part of the mass overhangs the base, filling the cavity, and there may be clear spaces at the sides up to the apertures of the Fallopian tubes.

The surface of the tumour, if small, may be more or less covered by a layer of mucous membrane like the decidua reflexa. Near the uterine muscle the tumour presents in section a patchy red and white appearance, suggesting placental site. This zone consists of tumour-masses, some actively growing, others more or less necrotic, mixed with areas of blood which simulate the uterine sinuses and are in fact frequently of this nature (see under Histology). The growing tumour for the most part lies between this layer and the uterine tissues, and may be seen in places as a somewhat irregular layer of tissue one or two millimetres

broad, which is just distinguishable from the muscle by its whiter and less shining appearance. Frequently there is very little of it, for the growth is an ulcer rather than a tumour. When the mole-like mass has been shed the



FIG. 296.—Chorionepithelioma malignum. (After McCann.)

appearance is that of an enlarged uterine cavity with ragged sloughing walls. (See Fig. 297.)

In some cases the tumour may be no larger than a hazel-nut, and in others it



FIG. 297.—Chorionepithelioma malignum, showing secondary nodule in vaginal wall (uterus and vagina removed *post mortem*). (After McCann.)

forms only a small ulcer burrowing deeply into the muscle, and containing some masses of tumour-tissue, and in some cases a few villi. In a number of cases the connection

with the uterine cavity has been lost, the tumour then being described as interstitial, and the cavity of the uterus may be practically normal.

The secondary tumours show a similar structure, appearing in section as rounded masses of firm blood-clot, at the edges of which, a broken and often very scanty layer of pale tumour-tissue can be seen. The vaginal tumours are globular, projecting nodules of a deep purple colour, varying in size from a pea to a small apple, and they have been described as 'thrombosed varices' or 'haematomata' (Fig. 297). Possibly some of the recorded cases of haematoma of the vulva, which refused to heal, and finally caused the death of the patient, were actually chorionepithelioma.

The commonest seat of secondary tumour is the veins of the vagina, and next, the lungs, corresponding to the dissemination by the venous blood-stream. The para-uterine veins, both at the cervix and in the broad ligament, are frequently converted into large varicose thrombosed bodies which originate as extensions or metastases of the primary tumour. The tumour in them shows a tendency to die out, which is of great practical importance and will be considered later. The secondary tumours have also been observed in nearly all the organs of the body in cases in which a general infection of the circulation has occurred. More than a dozen cases of secondary tumour in the brain have been recorded, and in several of these the only symptoms were those of apoplexy, or the gradual development of coma or paralysis. The emboli from which they arise are considerable masses of tumour, which have been broken off from the growing processes in the uterine veins. Sometimes they contain villi. They settle into the vaginal veins where they attach themselves, or they are carried to the lungs and become impacted as emboli at the branching of an artery. The walls of the invaded vessel degenerate and necrose, and dilate into varices or little aneurysms which undergo thrombosis or rupture and bleed profusely. By repetition of this the nodule comes to form a more or less globular mass principally composed of blood-clots of various ages.¹

Secondary infection of neighbouring lymphatic glands has been observed, but this is exceptional, and is probably not due to spread by the lymphatics, but is really the result of extension to the lymphatic glands of a metastatic tumour, which has arisen in a neighbouring blood-vessel through dissemination by the blood-stream.

In almost half of the recorded cases of chorionepithelioma the preceding pregnancy was a hydatidiform mole; but in the majority of the resulting tumours either the epithelial portion only of the placenta was represented, or only a few villi were

¹ Teacher, "Development and Natural Healing of Secondary Tumours of *Chorionepithelioma Malignum*," *Journ. of Path. and Bact.*, 1907, vol. xii. p. 487.

present in the primary growth. In some cases of the malignant moles, the vesicular mass was expelled from the uterus, but further growth of the same character occurred. In other cases, perforation of the uterus was the first sign that a dangerous disease was in progress. The uterus is found distended with vesicular mole, processes of which burrow into the muscular wall along the venous sinuses, extending even into the blood-vessels beyond it, and destroying it to a varying extent. In some cases a fatal result was brought about by the primary growth, through rupture of the uterus or haemorrhage, without metastasis having occurred. In other cases metastatic growths were formed which in several instances contained masses of vesicular villi.

The cases in which chorionepithelioma has been found outside the uterus, the cavity of which was found to be healthy, are numerous. The greater number of them have been examples of tumour in the vaginal veins, while a considerable number have been situated in the pelvis arising from tubal pregnancy, or possibly ovarian pregnancy, or possibly as the result of tumour in the para-uterine veins. In two cases at least there was no tumour in any of these situations, and in one of them a mass in the cavity of the right ventricle of the heart was regarded as the primary tumour. The cases not connected with extra-uterine pregnancy have been explained in various ways, either as (*a*) metastasis from a uterine placenta which had undergone malignant development but was subsequently thrown off completely, or (*b*) detached portions of a normal placenta which assumed the characters of malignant growths in their extra-uterine seat. It has been shown that portions of trophoblast, and even of villi, are detached into the circulation in normal pregnancies (Poten,¹ Veit²). A case recorded by Walthard (cited from Hitschmann and Cristofoletti³), in which extra-uterine tumours were formed during the course of a pregnancy, makes the latter explanation more probable, the placenta in the excised uterus having been found to be quite normal. This also accords better with the theory of tumour-formation, but in view of the cases of healing, which will be referred to later, the first alternative is by no means an impossibility.

A third possible explanation of a few of these cases may be found in the remarkable fact that malignant tumours, identical in their gross and histological characters with chorionepithelioma, have been observed apart from pregnancy, and even in men. This was first recognized by Kanthack and Eden,⁴ and demonstrated to the London Obstetrical Society in 1896 in connection with the discussion on *deciduoma*

¹ Poten, "Verschleppung der Chorionzotten," *Archiv f. Gyn.*, 1902, vol. lxxvi. H. 3, p. 590.

² Veit, "Deportation der Chorionzotten," *Zeitschr. f. Geb. u. Gyn.*, 1905, Bd. xlv. H. 3, p. 466.

³ Hitschmann and Cristofoletti, "Zur Pathologie und Klinik des malignen Chorionepithelioms," *Wiener klinische Wochenschr.*, 24th year, 1911, No. 19, p. 653, and No. 20, p. 705.

⁴ Kanthack and Eden, *Trans. Obst. Soc. Lond.*, 1897, pp. 149, 171, 183.

malignum. The primary tumour was called a 'sarcoma of the testis,' with secondary nodules in various organs. This observation remained isolated and inexplicable until 1902, when Schlagenhauer¹ published a similar case, and advanced the view that the primary growth was a mixed tumour or teratoma, and that the chorion-epithelioma-like tissues, which alone manifested malignancy, represented the trophoblast (chorionic epithelium) of the included ovum, which, according to current theory, is the source of teratoma.

Numbers of cases of this kind have now been recorded, for the most part connected with the testis. Lubarsch² described a chorionepithelioma occurring in a girl of thirteen years who had never menstruated: the tumour was attached to the uterus. In a dermoid of the ovary, L. Pick³ found a cyst containing simple vesicular mole. In a case described by Ritchie,⁴ the tumour was a dermoid of the anterior mediastinum of a man, which was in part chorionepitheliomatous, and had given rise to extensive secondary chorionepitheliomatous nodules in the lungs and various other organs.

Lastly, Emrys-Roberts and Walker Hall⁵ have described a retro-peritoneal tumour situated between the kidneys of a man which was typical chorionepithelioma. This, of course, does not in any way affect the specificity of the ordinary chorion-epithelioma.

IV. Histology.—Much of the controversy as to the nature of chorionepithelioma has arisen from defective knowledge of its physiological prototype, the chorionic epithelium. This has long been known to consist of two layers, the syncytium or plasmodial layer, and the cell-layer or layer of Langhans, and various opinions have been held as to their nature and origin, for an account of which the works of Peters,⁶ Webster,⁷ Bryce and Teacher⁸ or the text-book of embryology by Keibel and Mall⁹ should be consulted. Langhans,¹⁰ in his classic description, regarded the syncytium as foetal epiblast, and the inner layer now called by his name as foetal mesoblast. Another view which was widely held is that already referred to in discussing the theory

¹ Schlagenhauer, *Wiener klinische Wochenschrift*, May 1902, Nos. 22-23. (Chorionepitheliomatous growths in teratomata.)

² Lubarsch. Cited from Risel's review of the subject in *Lubarsch u. Ostertag Ergebnisse*, 11th year, pt. ii. p. 928, see p. 1031.

³ Pick, L., *Berliner klin. Wochenschr.*, 1902, No. 51, p. 1189.

⁴ Ritchie, *Journal of Obst. and Gyn. Brit. Emp.*, July 1903.

⁵ Emrys-Roberts and Walker Hall, *Journ. of Path. and Bact.*, 1910, vol. xiv. p. 135.

⁶ Peters, *Die Einbettung des menschlichen Eies*. F. Deuticke, Leipzig and Vienna, 1899.

⁷ Webster, *Human Placentation*. Keener & Co., Chicago, 1901.

⁸ Bryce and Teacher, *Early Development and Imbedding of the Human Ovum*. 4to. Maclehose, Glasgow, 1908.

⁹ Keibel and Mall, *Manual of Human Embryology*. Lippincott Co., Philadelphia and London, and S. Hirzel, Leipzig, 1910 and 1912.

¹⁰ Langhans, *Beiträge zur Anatomie u. Embryologie*, Bonn, 1882. Festschrift für Henle.

of Marchand, namely that the syncytium was derived from the uterine epithelium and the cell-layer from the foetal epiblast. The syncytium has also been regarded as of maternal endothelial origin. It may, however, now be taken as clearly established that the chorionic epithelium is entirely of foetal origin, and that the human ovum becomes attached to the uterus by embedding itself in maternal mesoblastic tissue by the activity of its primitive epiblast.

The following is an outline of what is at present held to represent the process. In the initial stages, the process of embedding in the case of the human ovum is in all probability similar to that which Graf von Spee¹ has described as occurring in the guinea-pig. The ovum, about the seventh day after fertilization, having attained the stage of an early blastocyst and measuring about .2 mm. in diameter (that is, approximately the size of a mature oocyte), comes to rest on the endometrium, destroys the surface-epithelium, and, continuing its destructive activity, burrows into the underlying mesoblastic tissue. Necrosis, followed by solution (digestion) of a considerable mass of the endometrium, follows, resulting in the formation of an implantation-cavity, the mouth of which is blocked by a mass of blood-clot, and the cavity becomes filled by blood shed from the opened-up maternal capillaries. The ovum, now rapidly differentiating, develops a thick layer of epiblast all round the blastocyst as in the ovum of the hedgehog. This structure, on account of its nutritive function, Hubrecht² termed the trophoblast or trophic epiblast. From a very early stage it shows a cellular layer (cyto-trophoblast) and a plasmodial layer (plasmodi-trophoblast). The plasmodium, or, as it is frequently termed, the syncytium, throws out buds which stretch towards the walls of the decidual chamber. It is continually being added to by active proliferation in the cellular layer. In the first place, the plasmodial masses exert mainly a destructive action, which results in the production of a relatively large implantation cavity, as seen in the Teacher-Bryce ovum. The destruction of the decidua is necessarily associated with the opening up of the blood-vessels, and haemorrhage occurs into the cavity; but the blood does not coagulate, and after a time it begins to circulate among the trophoblastic processes.

The active destruction of maternal tissue by the trophoblast is the most striking feature of the embedding of the ovum. The degenerated remains are dissolved and probably used up by the trophoblast for its nourishment. It appears probable that the vacuolated and spun-out condition of the plasmodium in this early stage is due to the formation in the vacuoles of a digestive fluid which is the principal agent of

¹ Von Spee, "Die Implantation des Meerschweinchen-eies in die Uterus Wand," *Zeitschr. f. Morphologie u. Anthropologie*, 1901, Bd. iii. H. i. p. 130.

² Hubrecht, "The Placentation of *Erinaceus Europaeus*" (Hedgehog), *Quarterly Journ. of Microscopical Science*, 1890, vol. xxx.

destruction. Soon a reaction in the maternal tissue outside the zone of necrosis sets in, and it begins to proliferate, developing into what is called in the human subject the decidua, and the process of attachment follows. An equilibrium becomes established between the trophoblast and the proliferating uterine tissue; the necrotic layer is removed, and union of foetal and maternal tissue then takes place. The foetal mesoblast now begins to grow out in villi which project into the trophoblast and later become vascularized by foetal blood-vessels. The trophoblast thus becomes the chorionic epithelium, and the cavities in it the intervillous spaces. The placenta, therefore, is composed of tissue which, with the exception of the basal layer of decidua, is entirely foetal, containing a circulation of maternal blood and a circulation of foetal blood.

There are now a number of admirable preparations in existence, such as the ova of Peters,¹ Jung,² Frassi,³ and Strahl and Beneke,⁴ in which the above stage has been seen and fully described. In the ovum of Peters the development of villi has just commenced and the mesoblastic cores are very short, but on the sides of them and on the chorionic membrane the characteristic two-layered epithelium is visible, enclosing the blood-filled intervillous spaces. The greater part of the placenta is a thick irregular shell of trophoblast which unites the tips of the villi with the maternal tissues. The latter, in the neighbourhood of the ovum, show already the characteristics of the decidua, but, quite close to it, they form a somewhat irregular zone of young connective-tissue cells, leucocytes, and young blood-vessels, which is called the boundary zone. With this the trophoblast is firmly united infiltrating it to a slight extent. The shell of trophoblast at a slightly later stage comes to be broken up, and is represented by the masses of chorionic epithelium by which the anchoring villi are attached to the decidua, and by islets of cells which occur here and there in the intervillous space.

The Teacher-Bryce ovum shows an earlier stage in which there is no formation of mesoblastic villi and only traces of the definite Langhans' layer of cells. The trophoblast is composed of a zone of cells, mostly irregular in size and shape, next the mesoblast and passing externally into a relatively large and irregular syncytial structure which is distinguished by the absence of cell-boundaries, and the presence of many vacuoles, some of which contain maternal blood. The other vacuoles are supposed to contain a digestive secretion by which the destruction of the surrounding maternal tissue is effected. The ovum lies in a relatively large implantation-cavity which is filled with blood and is bounded by a layer, varying in thickness, of necrotic endometrium mixed with a little fibrin. At some points the

¹ *Loc. cit.*

² Jung, *Beiträge z. frühesten Ei-einbettung beim menschlichem Weibe*, Berlin, 1908.

³ Frassi, *Archiv f. mikrosk. Anat.*, 1907, Bd. lxx., 1908, and lxxi.

⁴ Strahl u. Beneke, *Ein junger menschlicher Embryo*. J. F. Bergman, Wiesbaden, 1910.

syncytium appears to be attached to this, indicating the commencement of attachment of the ovum. The surrounding maternal blood-vessels are dilated, and a few of them have been opened and communicate freely with the implantation cavity. Outside the necrotic zone there is evidence of reaction on the part of the maternal tissues in the shape of an accumulation of leucocytes and swelling of the cells of the endometrium, many of which have the character of decidua-cells. The necrotic zone

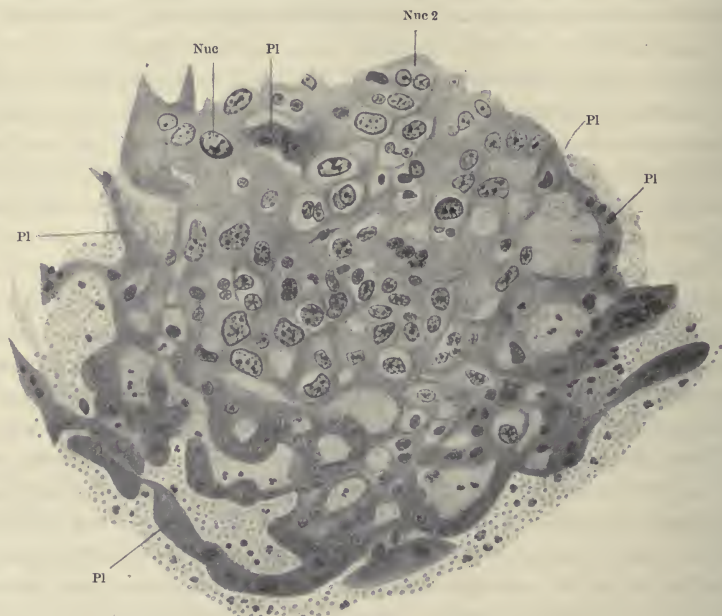


FIG. 298.—Tangential section of the blastocyst of the Teacher-Bryce ovum, showing the structure of the trophoblast.

Pl, plasmodium or syncytium; Nuc 1, cell with large single nucleus; Nuc 2, cell with two nuclei.
(\times about 270.)

corresponds to the so-called fibrin layer which is absent from the ovum at the stage of Peters but becomes so prominent in the later stages, forming the maternal boundary of the intervillous space. The cell layer at this stage may be described as an undifferentiated tissue out of which both the Langhans layer and the syncytium are formed. A tissue resembling it persists in the trophoblastic masses at the ends of the villi for a considerable period, and it is in this that the closest resemblance to the tumour is seen, not only in its histological characters but also in its physiological activity (Fig. 298).

The essential features of the trophoblast and chorionic epithelium can be studied in young ova up to about the sixth week. It varies considerably, apart from any definite pathological condition, especially in the amount of trophoblastic masses which are present and the degree of mingling with the maternal tissues. There are two principal types of cells, namely (1) the cell-layer or layer of Langhans, (2) the syncytium or plasmodium, and many intermediate forms which can be seen in the cell-islets and at the ends of the anchoring villi of the placenta, and—most important from our point of view—infiltrating the neighbouring maternal tissue.

(1) The cell-layer or layer of Langhans is a single layer of cubical cells having clear protoplasm and round or oval vesicular nuclei of relatively large size, moderately rich in chromatin, and showing a well-marked intra-nuclear network and nucleolus; multiplication is by indirect division, and karyokinetic figures can usually be found. The protoplasm contains glycogen. The cells rest on the connective-tissue core, the line of junction often being recognizable as a well-marked basement membrane.

(2) Enclosing the former, and separating it from the maternal blood in the intervillous spaces, is the syncytium, a layer of protoplasm in which no definite cell-boundaries are recognizable. The protoplasm has an opaque appearance, and takes contrast stains such as eosin somewhat deeply. In specimens fixed with osmic acid it is found to be loaded with finely divided fat. The nuclei are generally smaller than those of the cell-layer, oval or more elongated in shape, solid and staining more deeply.

The appearances, and especially the distinctness, of the two layers vary considerably, according to the age and state of preservation of the placenta and the character of the fixing agent used. Defective preservation tends to obscure the distinctness; also, about the third month, Langhans' layer becomes less active, gradually atrophies, and in the later months of pregnancy hardly anything but the syncytial layer remains. The syncytium frequently throws out buds, which may be detached from the main layer and lie free in the maternal blood as multinucleated giant-cells; sometimes the syncytium is so thin as to resemble endothelium.

The cell-islets and attaching masses of trophoblast are composed, for the most part, of elements of the cell-layer. They form a mass several cells deep between the tip of the connective-tissue core and the tissue to which the villus is attached (Fig. 299). The cells composing the mass retain their usual characters, but both nucleus and cell-body tend to be considerably increased in size. The syncytium does not enclose the cell-mass, but divides on either side, and is applied to the surface of the decidua lying between the attachments of villi. In the young placenta there is

commonly no mingling of the cells of Langhans' layer with the decidua, the two being separated from one another by a dense stratum of necrosed tissue mixed with fibrin—the so-called *fibrin layer*, or, as it might be better named, the *fibrinoid* layer.

The cell-islets often contain fibrin or necrotic material in varying amount, and the cells then tend to be enlarged and altered in character. Thus they may form masses of somewhat large cells, with very large nuclei, more or less embedded in fibrin, and presenting a superficial resemblance to decidua. They were formerly regarded as processes of decidua. Masses of syncytium and cells of intermediate character are usually seen in the cell-islets. In the edge of the decidua, and in the so-called fibrin layer, the hypertrophied cells may be found in varying numbers. In particular they tend to grow along the maternal vessels. Large multinucleated masses, identical with the buds of syncytium, are also to be found in the decidua and even deep in the muscle in considerable numbers (Fig. 299). These are generally held to be detached and infiltrating buds of syncytium, and are referred to as 'syncytial wandering cells.' Infiltration of the maternal tissues by foetal elements is therefore normal, and the degree of it which should be regarded with suspicion is difficult to specify.

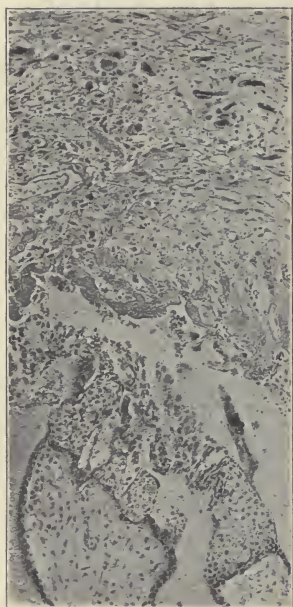


FIG. 299.—Decidua and villus (normal).

So many of the chorionepitheliomas have followed hydatidiform mole that some account of the latter is necessary. The vesicles like white currants, which are passed among blood-clots and accompanied by more or less severe haemorrhage, are well known, but it is not so generally recognized that a degree of hydatidiform degeneration is very common in abortions occurring at all stages, and that a few vesicles may be seen in placentae which have accompanied normal births. In some instances these are limited to a particular area of the placenta. More commonly they are scattered all through it. The abortions which show this change generally contain a malformed embryo, and, therefore, may possibly represent an earlier stage of the typical fully developed mole, in which the embryo commonly cannot be discovered. The etiology of the condition is obscure. The frequency with which it accompanies disease of the embryo has suggested that it is due to disordered nutrition of the

epithelium caused by the disease of the embryo. On the other hand it has been supposed that the cause of the degeneration of the villi was disease of the uterus and the disease of the embryo secondary.

Histologically, as described in an earlier paragraph, the villus in the vesicular mole differs from the normal villus in the degenerated condition of the connective-tissue core, and the comparative absence of blood-vessels, and in more or less hypertrophy of the chorionic epithelium. In the fully developed moles the majority of the vesicles may be completely necrotic, and the hypertrophy of the epithelium is only made out in those which are still intimately connected with the uterine

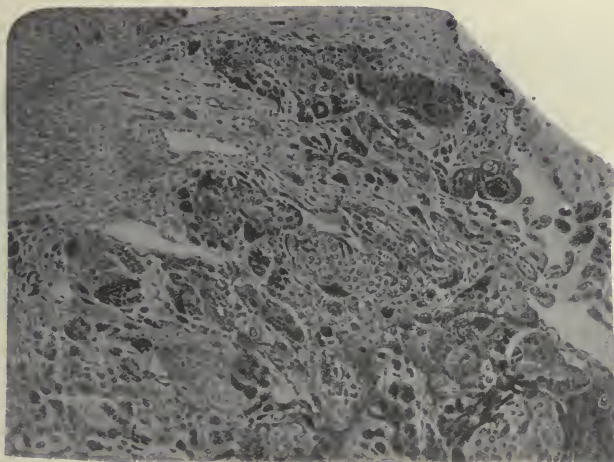


FIG. 300.—Chorionepithelioma showing typical masses of tumour invading the uterine muscle.

wall. This is due to the fact that the chorionic epithelium depends for nutrition on the maternal blood, and its coagulation among the villi destroys them.

In many vesicular villi, especially in small ova, the epithelium is not materially hypertrophied, and may even be atrophic; but, in the type which forms the intermediate stages to the tumour, the villi are clothed with very irregular epithelium, the cell-layer being heaped up in irregular thickenings, while the syncytium tends to be abundant and irregular and shows a vacuolated character like that of the outer layer of the trophoblast of the Teacher-Bryce ovum. Lastly, the amount of infiltration of the maternal tissue and growth into the maternal veins is greater than that associated with the normal placenta. In the malignant moles the character

of the epithelium is simply that of chorionepithelioma and very different degrees of overgrowth are found.

In pure chorionepithelioma the tumour-tissue presents a close resemblance in places to the normal chorionic epithelium, but evidences of exaggerated activity and perverted growth are apparent. To the naked eye, as already mentioned, the tumour really consists of a thin layer between the mass of clot and the uterine muscle. With a low power it is found that outrunners of the tumour-tissue burrow deeply into the muscle, especially along the tracks of the blood-vessels, loosening it out and pushing layers of it up into the body of the tumour. This may give rise to a somewhat alveolar

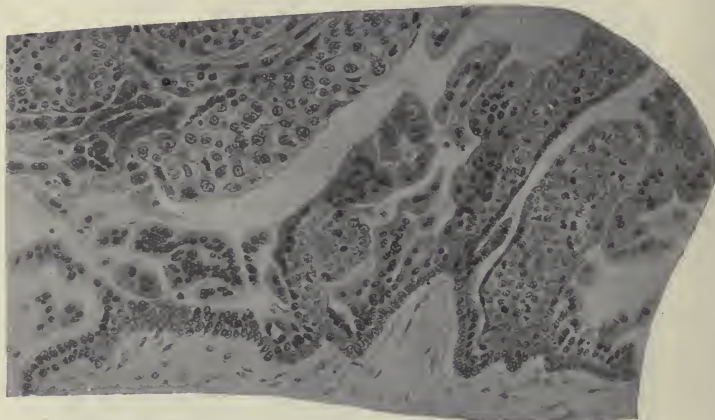


FIG. 301.—Portion of Figure 302 highly magnified, showing the relations of the tumour-cells to the villus.

arrangement (Fig. 300), but it is quite irregular and coarse, and totally different from the alveolar structure characteristic of carcinoma. The tumour, in fact, does not contain connective-tissue stroma or blood-vessels of its own, nor does it convert the adjacent normal tissues into a stroma. Some of the detached nodules of tumour seen in sections (see Fig. 300) are burrowing processes, others are actual metastatic growths in the uterine muscle.

Figure 300 shows most of the types of cell-formation under a low magnification. The darker masses represent the tumour, which, in this place, was infiltrating the uterine wall, principally in large masses, giving rise to the irregular alveolar arrangement already referred to.

Figures 301, 303, 304 illustrate under higher power the cell-forms and mode of growth in the body of the growing tumour. Figures 301 and 302 are taken from a

section of Haultain's¹ tumour, and may be taken to represent what is found in the malignant mole. They show part of a villus, to the epithelial outgrowths of which the origin of all the cell-forms in the tumour can be traced.

The structures which usually at once attract attention, and, in their peculiar combination with the other cell-forms, mark the tumour as something different from the ordinary sarcoma or carcinoma, are the derivatives of the syncytium, which appear as large, multinucleated masses of protoplasm of various shapes and sizes—rounded or oval giant-cells, long-drawn-out bands or whorls, or irregular sprawling masses. As in the malignant mole they are frequently riddled with vacuoles which spin them out into meshworks of very fine threads (Fig. 304). The vacuoles often contain fluid blood. The nuclei of the syncytium are generally small, oval, dense, and stain deeply and uniformly with the chromatin-stain, therein corresponding with what is seen in the normal placenta; but not infrequently nuclei of other types are seen; especially there

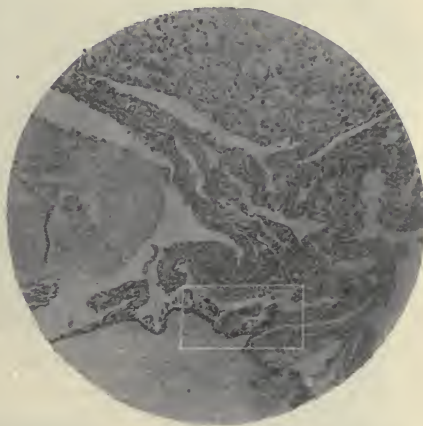


FIG. 302.—Hydatidiform villus with great trophoblastic proliferation.
(Haultain's case. Compare Figure 301.)

occur large, clear, and vesicular nuclei with a well-marked intranuclear network and one or more nucleoli, and staining comparatively lightly. Karyokinetic figures are absent, but masses of nuclei, closely packed as if multiplying by direct division, are frequent. The cytoplasm shows the usual opaque character and strong affinity for eosin and other plasma-stains. Masses undergoing degenerative change generally stain still more deeply, and their nuclei become small, shrunken, indented, and stain deeply. The syncytium is frequently loaded with fat-globules. Some of the syncytial masses infiltrating the muscle resemble hypertrophied muscle fibres, but are distinguishable by staining more deeply and by the absence of longitudinal fibrillation.

The cells derived from Langhans' layer usually form masses of some size intimately united with the syncytium. The regular relation which is seen on the villi, where the syncytium forms a thin layer enclosing the other layer of cells, may also be observed in the tumour, but generally the relation between the two is irregular; it is an exaggeration of what is seen in the cell-islets and at the attachments of villi

¹ Haultain, *Journ. Brit. Gyn. Soc.*, July 1899.

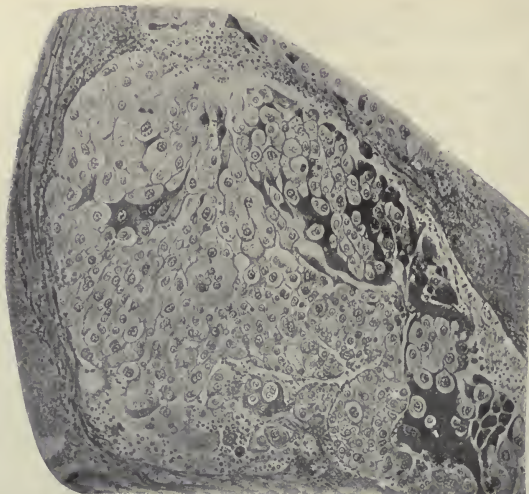


FIG. 303.—Chorionepithelioma; irregular cells principally belonging to the cell-layer.

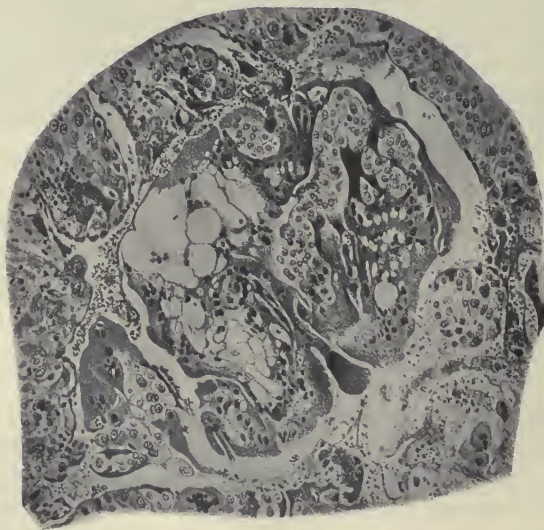


FIG. 304.—Chorionepithelioma; vacuolated syncytium, with masses of Langhans'-layer cells embedded in it, lying in the mouth of a blood-sinus.

to the decidua. Where the tumour is in contact with the maternal tissues, the syncytium, just as in the placenta, appears at the sides of the cell-masses, and the cells of Langhans' layer are seen in actual contact with muscle or whatever the tissue may be, and usually to some extent infiltrating it; there is no protecting fibrin-layer between the tumour and the maternal tissue such as occurs in the placenta. The syncytium may form a mere endothelium-like edge, or it may be a broad border to the cell-masses, and may also send irregular processes into them. Remains of connective tissue, as ragged shreds among the tumour-cells, are frequently to be seen.

The derivatives of Langhans' layer show the same characters as in the placenta. They form irregular masses like those at the tips of the villi. Figure 301 shows at once their origin, their characters, and some of the modifications which they undergo. In the youngest stage they are relatively small, polyhedral in shape, and closely packed together. The older cells are larger and clearer, and their boundaries are more easily made out; the manner in which they are packed together is typical of epithelial cells. The nuclei are larger, the cell-bodies are relatively still more enlarged. The karyokinetic figures may be perfectly regular, but many of them are excessively irregular. In certain fields they may be very numerous. Round about the cell-masses there is usually a certain amount of blood, which may be clotted or fluid, and which usually contains large numbers of polymorphonuclear leucocytes. These will serve as a measure by which the general size of the cellular elements composing the tumour may be estimated.

There are also cells of very varied shapes and sizes which do not conform to either of the types already mentioned. They are large cells, and contain from one or two to ten or more nuclei. In some tumours they form a large part of the cell-masses, and they are also seen, especially where the maternal tissues are being

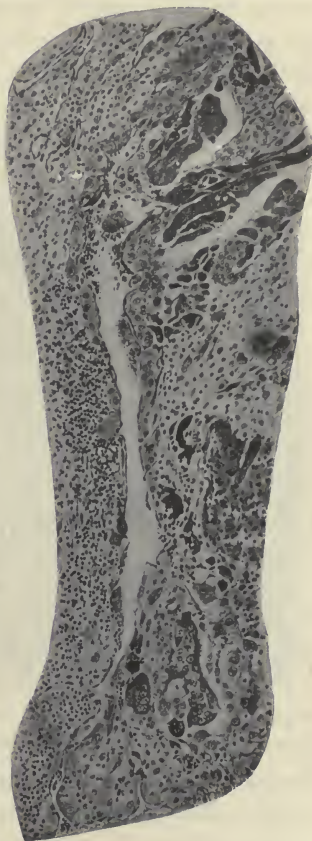


FIG. 305.—Blood-vessel with tumour-cells beneath the endothelium.

infiltrated by the tumour, either embedded in the eroded connective tissue or lying under the endothelium of blood-vessels (Fig. 305). Their resemblance to the cells of the very young and active trophoblast, as seen in a tangential section of the Teacher-Bryce ovum (Fig. 298), is very striking. In a section of tumour containing villi they can all be traced to the chorionic epithelium. The variety of cell-forms is far greater than can be found in the normal placenta, but in hydatidiform moles, especially those which have been examined *in situ*, the same great variety of cell-forms may be present, so that no sharp line can be drawn between the simple mole and the tumour.

In the neighbourhood of the tumour there is usually a certain amount of inflammatory reaction, and the maternal tissue may have the characters of granulation tissue. In parts where this has occurred, the edge of the tumour has quite the appearance of an infiltrating sarcoma, but the character of the tissue changes at once when followed back to the cell-masses.

In a certain number of cases, in what is termed the atypical variety, the tumour is principally of this type. The typical masses composed of cell-layer and syncytium may be found with difficulty or not at all. The cellular elements are principally large, irregular in shape, mononucleated, or sometimes multinucleated, and they infiltrate the uterine tissue in a diffuse manner. The reaction on the part of the latter causes the large tumour-elements to appear embedded among smaller cells of a different type. The infiltration is particularly noticeable about the uterine blood-vessels, the tumour-cells spreading under the endothelium and breaking into the lumen. Sometimes characteristic syncytial masses are seen which indicate clearly the nature of the growth, and the connection of the atypical form with villi has been demonstrated in a number of cases.

The degenerative changes which occur in the tumour in consequence of haemorrhage are of practical importance, because, in curetting, whether for therapeutic or diagnostic purposes, the material which is most likely to be scraped out is the old blood-clot and enclosed degenerated tumour-tissue which forms so great a part of the growth. The principal changes of this nature in the elements of the cell-layer are, crushing together of cells producing an irregular spindle shape, retraction of the cytoplasm from the nucleus, shrinking of the nucleus, and loss of the distinct intranuclear structure. In other cases the cells may present a peculiar loosened-out appearance. The division into two layers becomes lost and the syncytium preserves its characteristic features longer, therefore, if there is any living tissue found among the fibrin, it will probably be a mass of very large cells of various shapes and sizes (Fig. 306), the appearance at least suggesting malignant growth of some sort, if not definitely chorionepithelioma. Again a mass may be found in which the two usual

constituents are present, but the cells are all shrivelled, and the nuclei small and dense; in such a case the presence of a large multinucleated syncytium with its opaque protoplasm, or of a syncytial border to the mass, is the best guide to the nature of the tumour.

V. Clinical Features.—Apart from the possibility that amenorrhoea may occur in the initial stages, the earliest symptom is haemorrhage. This haemorrhage is severe, sometimes continuous with exacerbations, sometimes recurrent with distinct intervals. Not infrequently a history is obtained of the passage of 'shreds' or 'pieces.' The bleeding is not accompanied by much pain, and the patient frequently attaches little importance to it, and may allow it to continue for many months before seeking advice. She may remain fairly strong and well nourished for a considerable period, or other symptoms may supervene which lead her to obtain medical assistance.

Anaemia, expressed by the patient as feebleness, soon appears, and often becomes profound, constituting the most striking feature of her condition. Wasting is uncommon in the early course of the disease, and has been noted only in the most virulent varieties. Another train of symptoms soon appears, however, due to the

marked tendency which the new growth shows to undergo necrosis. A foul vaginal discharge is noted, there is pyrexia of irregular course, and the patient grows rapidly ill and emaciated. In other words, symptoms of intoxication appear, due to decomposition of the tumour-tissues, or actual infection takes place. Usually the fever is moderate, from 99·5° F. to 102° F., but occasionally rigors and more severe fever are met with. Probably, however, in many cases the rigors are not due to acute septic infection, but are really the result of extensive metastases of tumour. While the septic condition of the primary tumour is not uncommon, we do not know of any case in which pyaemia has developed or organisms have been found in secondary tumours.

Another very important sign is haemoptysis, which usually indicates the presence

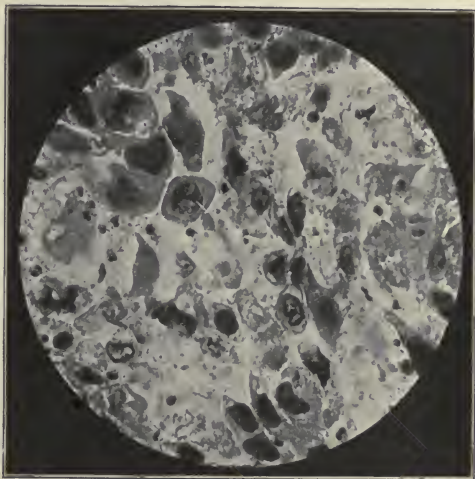


FIG. 306.—Somewhat degenerated chorionepithelioma, showing the large irregular cells.

of pulmonary metastases. In rapidly advancing cases it has been noted to have occurred comparatively early ; and, when the uterine signs have been not very distinct, and there have been in addition fever, emaciation, and anaemia, it is not surprising that such cases have been diagnosed as pulmonary phthisis.

In some of the cases where metastases have formed in the lung, irregular signs of consolidation or of pleural effusion have been found ; but as a rule the examination of the chest has given no certain information, the tumours being too small to produce characteristic physical signs. In one case characteristic cells are stated to have been found in the sputum.

More rarely cerebral symptoms (convulsions, hemiplegia) have been the first to attract serious notice ; such symptoms are due to cerebral metastases, and, of course, indicate a rapidly approaching fatal termination. In some cases apoplexy with large cerebral haemorrhage has occurred, the nature of which was only established by the autopsy. Haematuria from extension to the bladder may also be met with, but is rare.

On physical examination the presence of vaginal nodules may be the first evidence which is met. The condition of the uterus next attracts attention. Where the primary growth does not occur in the uterus, and in rare instances where it does, this organ shows no change on physical examination. In the great majority of cases it is more or less enlarged : it may be merely 'bulky,' or it may be large enough to reach to a point half-way between the pubes and umbilicus. It is smooth in outline, except in advanced cases. The condition of the cervix varies greatly. It may be patulous, allowing the finger to be introduced into the uterine cavity, when a friable, easily bleeding mass of tissue will be detected in some part of the uterine wall ; more rarely it is closed, and no indication of the nature of the uterine contents can be obtained. Interference with the tumour often results in copious and uncontrollable haemorrhage, which is very suggestive of the presence of malignant growth as against simple retained placenta.

The physical examination may reveal the presence of tumours in the labium or *portio vaginalis*, which are rare, or in the vaginal wall, which are common. As already noted, they may be secondary to tumour within the uterus or they may be primary. When accessible in this way to visual examination the growth appears as a soft, deep purple, 'plum-coloured' nodule, or it may be several nodules, usually covered with intact mucous membrane, but sometimes ulcerated, and always liable to bleed with alarming freedom if roughly handled. Thickening in the broad ligaments may suggest the presence of infected and thrombosed para-uterine veins.

The tubal cases have most commonly been taken on clinical examination for ordinary instances of tubal gestation, but some have been regarded as tumours and in

one or two the presence of a vaginal metastasis which could be excised, and submitted to microscopic examination, has allowed the correct diagnosis to be made before operation.

VI. Etiology.—In regard to causation no more is known of chorionepithelioma than of any other malignant tumour. In spite of the anatomical and physiological peculiarities of the normal tissue, the relations of the tumour arising from the chorionic epithelium to the general problem of the nature of malignancy are not essentially different from those of malignant tumours of the other tissues of the body. Chorionepithelioma is in no sense a teratoma. The trophoblast is essentially a somatic, not a gametogenic, tissue. The ovum may justly be described as a parasite upon the maternal organism, or as another individual, but the relationship is normal, and the physiological conditions of the endometrium in due course normally restrain the growing energies of the trophoblast, just as other tissues of the body normally preserve a proper balance among themselves.

It has been observed that in a certain proportion of cases in chorionepithelioma and hydatidiform mole, the ovaries contain corpus luteum cysts¹ and an excessive amount of lutein cells which are sometimes distributed diffusely through the ovarian stroma. On account of this, it was suggested that the cause of both hydatidiform mole and chorionepithelioma might be found in perverted ovarian activity as indicated by excessive production of and pathological changes in the lutein tissue. It is, however, equally probable that the developing trophoblastic tumour is the cause of the abnormal formation of lutein tissue. The fact that this tissue may be excessive in amount is striking, but it is neither specific for mole or tumour, nor is it invariable.

Diminished resisting power on the part of the maternal tissues, due to frequent child-bearing or to local disease; absence or imperfect formation of the fibrin layer; or, on the other hand, some cause inherent in the ovum, have all been suggested as reasons for the ungoverned proliferation of the chorionic epithelium in the tumours; but all lack a sound scientific basis of fact. Little attention has been paid to the presence of parasite-like cell-inclusions, but they have been seen.

VII. Incidence.—Chorionepithelioma is essentially a disease of fertile women, but we do not at present know whether race, climate, or social conditions exert any influence upon its occurrence. It may occur at any age within the limits of possible pregnancy, cases having been recorded at the age of 17 years and at 55 years. In the series of 189 cases tabulated by the writer in 1903, the average age was 33 years; 67 per cent of the total number of cases occurred between the ages of 20 and 40, but there were 6 cases below 20 and 9 cases over 50 years. Considering the infrequency

¹ For an example of this condition see Figure 395, page 773.—EDITORS.

of pregnancy after the age of 50, the latter figure is very striking, and appears to indicate an increased tendency to the occurrence of this disease at the close of the fertile period of life. In 4 of these 9 cases the menopause was supposed to have been passed before the onset of the disease. It must, however, be borne in mind that hydatidiform mole, which is a frequent precursor of chorionepithelioma, is also more prevalent towards the extremes than in the middle of the fertile period, and may thus influence the incidence of this disease in women of 50 years and over as well as in those below 20.

The age incidence is, however, largely influenced by another factor, viz. fertility. Nothing is more striking, as these statistics clearly show, than the rise in frequency of the disease *pari passu* with the degree of fertility. In 156 of the series of 189 cases in which the necessary data are available, we find the disease arising—

(1) In connection with the first pregnancy in . . .	4.77 per cent
(2) After one preceding pregnancy in . . .	15.37 „
(3) After 2 or 3 preceding pregnancies in . . .	28.24 „
(4) After 5 or more preceding pregnancies in . . .	37.8 „

The average number of pregnancies, estimated in a sufficient series of fertile women, is less than 4; therefore those in whom 5 or more have occurred represent a decided minority, and the large proportion of cases of chorionepithelioma occurring in women of this high degree of fertility must represent an increased liability in them to this disease. It is worth while in this connection to note that in the 9 cases in which the disease occurred over the age of 50, the average number of pregnancies was a fraction over 10; it is, therefore, probable that the high degree of fertility found in those women is a more important predisposing factor than the age. Frequent child-bearing, as we know, may predispose to the occurrence of malignant disease in the cervix, but it is impossible to speculate profitably upon the manner in which it may influence the occurrence of the disease under consideration.

Next to the incidence of this disease with regard to age and fertility, the most important points to be noticed are its *relation to the immediately preceding pregnancy*, and the *nature of that pregnancy*. With regard to the former, the immediate clinical connection is in some instances perfectly clear. A small number of cases have been recorded in which the disease has manifested itself during pregnancy. In one of the cases of L. Pick¹ a vaginal primary nodule formed, and was discovered at the fourth month of pregnancy. It was diagnosed as chorionepithelioma from microscopic examination after removal, but the patient refused to submit to hysterectomy, and spontaneously aborted a hydatidiform mole three days later. There was no uterine

¹ L. Pick, *Berliner klin. Wochenschr.*, 1897, Nos. 49-50.

tumour, and the patient was known to be well four years later, having borne a child in the interval. A case recorded by Walthard began during an apparently normal pregnancy.

In a much larger number of cases the symptoms characteristic of the disease have followed immediately upon the termination of pregnancy, either by abortion or by labour at or near term, without any recognizable clinical interval. Cases in which the disease followed a first pregnancy are particularly interesting in this respect, and among the sixteen primiparae in the writer's list this form of onset was found in twelve, *i.e.* in three-fourths of the total number. In a few cases there has been pronounced ill-health during the pregnancy and the child has been feeble.

In the majority of cases, however, a definite interval is apparent between the termination of the last evident pregnancy and the onset of the disease. In many cases some difficulty arises at this point, owing to the nature of the initial symptoms. A short period of amenorrhoea is followed by haemorrhage, and frequently by the discharge of clots or 'fleshy pieces'; and with recurrence of the haemorrhage the characteristic symptoms of the disease in the early stage are developed. No direct evidence of abortion can be obtained, and the question arises whether the preliminary period of amenorrhoea indicates the occurrence of conception, or whether it is to be regarded as the earliest symptom of the disease itself. In a smaller number of cases (43 in the writer's list) a definite interval of freedom from symptoms, varying from one month to over one year, intervened between the termination of the last evident pregnancy and the clinical onset of the disease. A considerable number of cases have been recorded in which there was a clear interval of more than twelve months, the longest being as much as nine years, and, in most of these, the menstrual function was regular and normal in the interval. These very long periods of latency are, however, open to question. In some of the cases the principal reason was that the patient had passed the menopause, but it is known that pregnancy may occur under these circumstances, and this, in our opinion, is much more likely than the persistence, for a very long period, of a structure normally so short-lived as the trophoblast. There is no evidence that the degree of malignancy bears any relation to the intimacy of the clinical association with pregnancy. It may therefore be said that in respect of its clinical relation to pregnancy three types may be distinguished:

(1) That in which the disease develops during pregnancy.

(2) That in which the disease develops after a definite interval of several months to several years.

(3) That in which the clinical relation to pregnancy is obscure.

The *nature* of the pregnancy immediately preceding the occurrence of the disease

is a point of great interest and importance, and has been already alluded to. In the writer's series (188 cases only) we find—

After hydatidiform mole	73 cases = 36.6 per cent
„ abortion	59 „ = 31 „
„ labour at or about term	49 „ = 28 „
„ extra-uterine gestation	7 „ = 4.4 „

Hitschmann and Cristofolletti in 240 cases found—

116 followed mole = 48 per cent
73 „ abortion = 30.4 per cent
51 „ normal birth = 21 per cent

They also give statistics of 200 cases of hydatidiform mole of which 15 resulted in chorionepithelioma, that is $7\frac{1}{2}$ per cent. This figure, however, is probably too high, as 5 of the cases were recorded out of 15 by Krömer,¹ and, as they all recovered after operation, we are inclined to question the validity of the diagnosis of malignancy. Omitting Krömer's figures, the incidence is about 5 per cent, which is probably still too high. It is unnecessary, as some authors have advised, to perform hysterectomy after every case of hydatidiform mole; but the patient should certainly be kept under observation for many months. Taking the more recent figures it will be seen that in only 21 per cent was the immediately preceding pregnancy normal; in the remaining 79 per cent (*i.e.* in more than three-fourths) the pregnancy was abnormal.

VIII. Diagnosis.—It is obvious that during the early stages chorionepithelioma presents nothing that is characteristic either in symptoms or in physical changes. Setting aside the hydatidiform-mole cases, which are in a category by themselves, the clinical phenomena are those of incomplete abortion, or the retention of portions of placenta after labour, often combined with those of septic infection. The conditions can only be regarded as calling clearly for exploratory measures in order to enable a diagnosis to be arrived at. Recurrent haemorrhage in association with recent pregnancy, especially in women of unusual fertility, and, above all, after hydatidiform-mole abortion, must be regarded as an indication for exploration of the cavity of the uterus, and it is much to be regretted that in the minds of women of the poorer classes this symptom carries with it so little significance. All material which has been removed from the uterine cavity should be carefully preserved and submitted to microscopic examination.

If the symptoms are so urgent as to suggest chorionepithelioma, the exploration should be made with the greatest gentleness for fear of producing haemorrhage or dissemination of the tumour, and careful search should first of all be made for vaginal

¹ Krömer, cited from Hitschmann and Cristofolletti.

infection. If this be found, the nodule should be excised and further examination suspended until the report on its microscopic structure has been obtained.

Differential Diagnosis.—The risk of regarding cases of chorionepithelioma of the uterus as cases of septic intoxication due to retained products of conception must ever be borne in mind. Confusion with sloughing myoma, or with sarcoma or carcinoma of the body of the uterus, may occur, but is comparatively unimportant. Haemorrhage, unless profuse, followed by fever and an offensive discharge, occurring after pregnancy and associated with an enlarged uterus containing masses of broken-down tissue, forms a clinical picture suggestive of puerperal infection with retained products of conception. But, if the pregnancy has been a hydatidiform mole, the case should always be regarded with the greatest suspicion, for it is quite probable that the condition will turn out to be chorionepithelioma. Owing to its soft and spongy nature, the new growth is readily removed with the curette, leaving the uterine wall, as felt by the examining finger, smooth and uniform. This will appear to confirm the view that the tissue consists, not of new growth, but of placental remains, for, if it had been the former, one would expect inequalities or excavations to be left in the uterine walls. A knowledge of this peculiarity of chorionepithelioma should serve to avoid the fallacy of this conclusion. The effect of clearing out the uterus upon the course of the disease also provides a further point of distinction between these two conditions. In the case of chorionepithelioma well-marked improvement follows, the haemorrhage may cease, and the patient's general condition is benefited. But this improvement is only temporary, recurrence of the haemorrhage within a few days or weeks will occur, and if the uterine cavity be again explored, large quantities of soft tissue will be found, although the uterus was left empty and with smooth walls after the operation. This rapid re-formation (in two to four weeks) of the tissue *débris* is characteristic of the disease, and, in the opinion of Veit,¹ serves to distinguish it from septic retained products of conception, even without the aid of the microscope. But, whenever possible, the diagnosis should be established after the first operation, and without waiting for the reproduction of the uterine growth, otherwise valuable time will be lost before the necessary radical operation is performed. It must be borne in mind that in a certain number of cases, after exploration and clearing out of the uterus, there has been a complete cessation of symptoms, including even haemorrhage, for a period amounting to several months during which time the tumour continued to advance. More commonly, however, symptoms soon recur.

In a number of cases it is recorded that after curetting severe rigors occurred, and the patient succumbed apparently from septicaemia, autopsy alone revealing

¹ Veit, *Handbuch der Gynäkologie*.

the presence of chorionepithelioma. Hitschmann and Cristofolletti¹ have devoted particular attention to this occurrence, and, from study of the recorded cases and from their own experience, have come to the conclusion that the symptoms were not due to infection but to dissemination of tumour caused, as has indeed been suggested by various writers, by the operative interference; further, they are of the opinion that dissemination due to operation or even simple manipulation is a much more frequent occurrence than has been generally supposed. They have pointed out that internal metastasis was less common in patients who died without operation than in those who succumbed after operation. In patients dying during, or immediately after operation, internal metastases were absent from more than one half, but, where death was delayed for any considerable time, the internal metastases were present in a large majority. The natural conclusion follows that, where chorionepithelioma is suspected, the greatest care should be exercised both in examination of the uterus and in curetting for the purposes of diagnosis.

Microscopical Diagnosis.—The microscopical recognition of the tumour when removed with the uterus is easy; there is no tumour with which any one of moderate histological experience can confuse it. Cases of carcinoma of the uterus occur occasionally, the epithelial masses of which resemble chorionepithelioma in containing individual cells and syncytial masses, but their mode of growth in an alveolar stroma is totally different from that of chorionepithelioma.

The diagnosis from curettings is a very different matter. The material which is removed may be only blood-clot with degenerated and dead tumour-tissue. The impossibility of drawing a sharp histological distinction between the villi of simple hydatidiform mole and those of chorionepithelioma or malignant mole, has been insisted on. Notwithstanding all this, one can hardly overestimate the value of the histological test, although the rule that diagnosis *should not be allowed to rest on microscopic evidence alone* applies more strongly perhaps to chorionepithelioma than to any other tumour, on account of the fact that the features of the tumour are also those of the chorionic epithelium, both anatomically and in respect to functional activity.

The danger, therefore, of mistaking conditions which are probably normal or only slightly pathological for a malignant growth is admittedly great; but microscopic examination is the method most certain to give warning that trophoblastic elements, which are potentially tumour, still remain within the uterus. Only too frequently in the history of cases the statement is found that portions of 'retained placenta' were removed and thrown away without being submitted to microscopic examination. Then, after weeks or months, when the clinical signs had become so

¹ Hitschmann and Cristofolletti, *loc. cit.* pp. 662 *et seq.*

urgent that hardly a doubt remained, the diagnosis was established by this means, but too late. Krebs,¹ for example, points out that four months were probably lost in the case which he described, through examination of the curettings being limited to the identification of them in the fresh state as placental tissue. In the case of Austerlitz² the warning was actually given, but was disregarded. Both cases terminated fatally. In the case of Graefe³ radical operation was delayed with fatal result because villi were present.

On the other hand, in the case of Littauer,⁴ clinically and microscopically the disease appeared to be a malignant chorionepithelioma following hydatidiform mole, but operation was delayed because villi were present, and the patient made an uninterrupted recovery. Further, in two cases in the experience of the author hysterectomy was performed upon clinical grounds only, and the contents of the uterus were found, on microscopic examination, to be simple remains of an ovum.

As a matter of routine in all cases with suspicious clinical histories, the whole of the curettings should be submitted to the pathologist in proper condition, that is to say, preferably they should be submitted fresh, in order that he may pick out the lighter-coloured portions of tumour-tissue from the old blood-clot which is apt to form the greater part of them. For this purpose it is often of considerable assistance to float out the material in 30 per cent alcohol for an hour or two, giving one or two changes. This will be found useful particularly when the material has lain for a time and the haemoglobin has diffused into the tissue. Portions of the blood-clot should also be examined. When the material has to be sent some distance to the pathologist it should be sent in a dry, well-corked bottle, as autolytic changes will not materially interfere with diagnosis under forty-eight hours. The material should never be placed in water or ordinary antiseptic solution. Alcohol of any strength above 30 per cent, or formalin 5 per cent solution in water, or any of the recognized fixing reagents should be employed if the material has to be kept for a longer time, and *the whole material should be submitted.*

On account of the friability of the tissue, curettings should always be cut into sections by one of the methods in which they are carefully embedded; and paraffin is preferable to celloidin, because it is more rapid, and because by it the characters of the cells are more delicately displayed.

When, on microscopic examination, masses of trophoblastic tissue are found such as those figured (Figs. 303 and 304) apart from villi more than two or three weeks

¹ Krebs, *Monatsschr. f. Geb. u. Gyn.*, 1900, vol. xi. pt. v.

² Austerlitz, *Monatsschr. f. Geb. u. Gyn.*, 1902, vol. xv. pp. 16, 71.

³ Graefe, *Zentralbl. f. Gyn.*, 1902, No. 20, p. 521; and Risel, 1903, Case vi.

⁴ Littauer, cited from Hitschmann and Cristofaletti, *loc. cit.* p. 658.

after confinement, the diagnosis of chorionepithelioma may be given with confidence. When villi are present the case is very different. The possibility of malignant mole must not be forgotten, nor the fact that simple hydatidiform mole is not without danger, and greater weight should be given to the clinical signs than to the microscopic evidence. Statistics show that the cases regarded as chorionepithelioma following hydatidiform mole were less malignant than those which followed abortion or pregnancy carried to term. These are the cases in which villi are most commonly found in curettings. Delay, with careful watching of the patient, will generally prove more satisfactory than precipitate operation in any case in which villi are found.

No precise statement can be made as to the amount and character of epithelial overgrowth upon villi that would warrant a diagnosis of malignancy. Complete recovery after simple curetting has been seen in cases similar to that from which Figures 301 and 302 were taken. In that case, Haultain's, the uterus was excised with satisfactory result after the patient had been reduced to an extreme degree of weakness by repeated haemorrhages. Whether or not the diagnosis of chorionepithelioma should be revised in the latter case, as Haultain himself has suggested, the fact remains that clinically the only possible treatment was hysterectomy.

In shreds of uterine tissue removed by the curette a certain amount of infiltration by trophoblastic elements is commonly found for several weeks after the termination of pregnancy. This is particularly the case after hydatidiform mole. In these cases great stress has been laid on the occurrence of necrosis of maternal tissues and infiltration of the muscular wall, but no sharp line can be drawn. The position has been stated by Robert Meyer¹ in the following terms :

"So long as portions of placenta are present, the recognition of haemorrhagic and necrotic tissue, leucocytic infiltration, and cells of Langhans within the mucous membrane is insufficient [to justify the diagnosis of chorionepithelioma] for these also form a part of the picture of placental retention. The significance of the same discovery in the uterine muscle is much more difficult to estimate. Only when one can be quite certain that all remnants of villi have been removed is it possible to reckon on the disappearance of the chorionic epithelial elements in the muscle in from two to three weeks. After this time, should suspicious materials be expelled or should a new curettage bring to light fresh masses of chorionic epithelium, then, no matter what their condition, they must be regarded as suspicious. Before this time, the recognition of large epithelial and epithelioid cells of varying form with large or grouped nuclei, and multinucleated giant-cells, by no means justifies the diagnosis of malignant tumour, even when they appear in long processes and broad masses and replace and break through the walls of the vessels, for this chorionic invasion can occur apart from malignant new formation."

¹ Cited from Hitschmann and Cristofolletti, *loc. cit.* p. 659.

It is possible that Abderhalden's reaction for the diagnosis of pregnancy might be of assistance in some cases, especially those in which the tumour was situated outside the uterine cavity and where the relation to preceding pregnancy was not clear.

IX. General Course and Termination.—*Prognosis.*—No form of malignant new growth offers greater variation in malignancy than chorionepithelioma. Cases of extreme virulence may be met with in which death quickly occurs from widely distributed metastases, even when radical operation is performed, after a very short interval—varying from a few days to one month—has elapsed from the onset of the symptoms. Further, two to three cases of death from haemorrhage following spontaneous perforation of the uterus from chorionepithelioma, arising in malignant hydatidiform mole, have been recorded, where no previous symptoms except haemorrhage and rapid increase in size of the uterus were noted. On the other hand, recovery has been recorded after a radical operation performed when fifteen months and even eighteen months had elapsed since the onset of the symptoms. Many examples intermediate in virulence might be quoted, but the reader who is interested in this point should refer to the tables given by the writer in 1903 and for later cases to the admirable article by Hitschmann and Cristofolletti referred to on page 564.

Another point of great interest which has been established is, that in some cases, radical operation performed after the formation of metastatic growths may be followed by complete recovery and disappearance of the metastases. Chorionepithelioma is the first example of a definitely malignant growth in which this interesting occurrence has been demonstrated.

The spontaneous disappearance of vaginal metastases after removal of the uterus was noted by Neumann,¹ and in the case of Kelly and Teacher² it was demonstrated histologically that some of the tumours in the para-uterine veins had become completely extinct, the tumour-cells being embedded in thrombus the formation of which apparently had completely destroyed them. In a case of Marchand (Everke)³ a mass of thrombosed uterine veins was left behind, yet perfect recovery took place. In several cases the diagnosis of metastasis has rested upon the fact that haemoptysis had appeared which soon ceased after the operation, and Risel⁴ in 1903 reported the observation of healed (encapsuled and fibrosed) nodules among those still growing in a case which terminated fatally. In 1907 the writer of the present article was able

¹ Neumann, *Monatsschr. f. Geb. u. Gyn.*, 1897, vol. vi. p. 17.

² Kelly and Teacher, *Journ. of Path. and Bact.*, 1898, p. 358.

³ Marchand (Everke), *loc. cit.*, 1895.

⁴ Risel, *loc. cit.* p. 56.

to demonstrate healed nodules in a case of chorionepithelioma, and to give some account of the healing process (see p. 563).

In the case in question the uterus was excised on account of what was supposed to be a sloughing myoma. The patient died a few days later from peritonitis, and, at the autopsy, the lungs were found studded with small nodules which were taken for examination. There was thrombosis of practically all the veins connected with the uterus and this was of some age. Microscopic examination showed that it had commenced by tumour-formation in the veins outside the uterus, but that the tumour had become completely extinct throughout the thrombosed region. Apparently the thrombosis had also stopped the supply of tumour-emboli to the lungs; but it had not prevented the growth of the intra-uterine tumour, which was found to be of considerable size, to contain a large quantity of active tumour, and to have grown completely through the fundus uteri into the peritoneal cavity.

The study of the secondary nodules from this case, and many others, showed that the haemorrhage and thrombosis by themselves are insufficient as a rule to destroy the tumour, which continues to grow at some point although destroyed at others; but they are clearly important factors by destroying tumour-tissue and provoking increased tissue-reaction around the nodule. In a few instances complete destruction of all the tumour in a nodule by haemorrhage has been observed. In the lung-tissue surrounding the nodules there is normally generally considerable inflammatory reaction in the alveolar walls, with the formation of new connective tissue and a sort of pneumonic process with deposition of fibrin in the alveoli. These constitute a barrier to the advance of the tumour which is usually quite insufficient to arrest its advance. But occasionally the resistance of the normal tissues, aided by the damage inflicted upon the tumour by the clotting of the blood, cutting off its source of supply, proves successful, the tumour dies out, and the nodule becomes converted into a mass of cicatricial tissue. The same factors, occasionally aided by external sloughing, are probably concerned in the healing of vaginal nodules.

There are, in addition, three extraordinary cases in which primary uterine tumours and metastases were present, yet healing occurred without radical operation. In the first case, that of von Fleischmann,¹ the uterus was perforated during the performance of curetting and the operation was suspended with a view to obtaining consent to a radical operation. This was refused by the patient and she left the hospital. She made a rapid recovery, the normal menstruation was established three months afterwards, and she was known to be well several years later. In the second

¹ Fleischmann, *Monatsschr. f. Geb. u. Gyn.*, April 1903.

case, that of Hörmann,¹ a large uterine tumour was present with secondaries in the vagina which were removed and recurred. Clinically the case showed advanced anaemia, cachexia, rigors, and haemoptysis which was attributed to secondary invasion of the lungs. Yet after a time the tumours and the symptoms gradually disappeared, and a year later the patient passed through a normal confinement, and yet another year later was in good health.

A third equally striking case in which the operation was begun and abandoned on account of the extent of the tumour, which involved the vagina and bladder and extended far and wide in the pelvis, is reported by Hitschmann and Cristofoletti.² The patient, after the operation, showed rapid improvement in health, and examination a month later showed that the whole tumour of the uterus and surrounding tissue had disappeared. Seven years later the patient was in perfect health. No complete explanation of these three cases can be offered. Undoubtedly thrombosis had occurred in the uterine veins, but, as we have seen in the writer's case above described, that does not necessarily arrest the advance of the primary tumour. There appeared to be a complete disappearance of the proliferative energy of the tumour, followed by rapid absorption by the ordinary reparative processes, which it seems improbable could by themselves have been capable of the sudden arrest of the tumour which was observed in all three cases. The histological characters afford but little enlightenment—in the case of Fleischmann the growth was of the atypical variety but appeared to be thoroughly active.

The cases in which chorionic villi are found in the tumour, whether these present comparatively normal characters or whether they are hydatidiform, are less virulent than those in which only the epithelial elements are found. But, on the other hand, there are the cases of malignant hydatidiform mole which are extremely virulent. The cases which have followed normal pregnancy are on the whole more deadly than those which followed abortion, and this fact may have a simple physical explanation, namely, that the uterine vessels are exceptionally wide and favour the rapid occurrence of metastasis. According to Hitschmann and Cristofoletti, the result in many cases seems to be a matter of chance, depending perhaps upon the occurrence of thrombosis of the uterine veins, or upon the absence of much manipulation prior to the radical operation.

It seems impossible at present to give statistics of any great value as to the result of operation. The tumour is comparatively rare, but by no means all the cases which have been seen have been recorded, and it is probable that statistics based upon

¹ Hörmann, *Beiträge z. Geb. u. Gyn.*, 1904, viii. 3.

² Hitschmann and Cristofoletti, *loc. cit.* p. 707.

the observations of the earlier years, when practically every case was recorded, will be found more reliable than any that could be compiled at present. Accordingly we prefer to rely on the results of the statistical study by the writer published in 1903. In 189 cases radical operation was performed 100 times. Of the unoperated group all ended fatally except the case of von Fleischmann. The percentage of recovery in all cases was only 34.2, and many of these cases were reported soon after the operation. The remaining 100 submitted to operation showed 63 recoveries and 37 deaths, a percentage of 63 of *immediate recoveries after operation*. Of the 37 deaths, 12 occurred within a few days, and these may be set down as incidental to the weakened condition of the patient by the time the operation was undertaken, and such complications as tremendous haemorrhage on the attempt being made. In 16 of the remaining 25 there was no marked improvement or interval of good health after the operation.

Out of the 63 recoveries, 32 were reported well six months or more after the operation, and out of this number, 24 (24 per cent) remained well for more than a year, and of these again, 13 were reported well more than two years after the operation. Among the fatal cases it was remarkable that in 5 only did the disease recur after a longer interval than six months, and the longest interval between operation and death was one year. Death after a longer interval has since then been reported. Still, one is justified in the conclusion that if the patient survives more than six months without signs of recurrence, the probability of recovery being permanent is considerable, after one year it is very great, while cases in which two years have elapsed may be regarded as absolute recoveries.

From study of a large number of the later published cases it was found that the malignant type which went rapidly to a fatal termination, usually in spite of operation, was more numerous than that in which a successful result was obtained. The figures in the writer's original series are also striking in respect that 42 of the cases with a percentage recovery of 78 followed hydatidiform mole. Possibly a considerable number of these should not have been described as *chorionepithelioma malignum*.

The cases that have been observed in Glasgow number 18, 1 of which was tubal and 1 has been under observation only a few weeks. Omitting the last, 17 remain, 2 of which were of the most malignant type, and operation was not attempted. In the remaining 15, recovery, which was maintained for at least a year, took place in 6, a percentage of 40. If the 2 cases in which operation was not attempted be included, the percentage of recovery falls to 35.3, which is probably about the reasonable expectation of success under present conditions. Seven of the deaths occurred in connection with the operation, the patient having been in extremely bad condition

from haemorrhage or sepsis, 1 a month later after apparently good progress, and 1 survived nine months. There was no *post-mortem* examination in either of the last 2 cases.

The interval which has elapsed between the onset of the symptoms and the performance of a radical operation appears to be no more reliable as a guide to prognosis than any other indication which we possess. This is well brought out by a study of the 100 cases in which a radical operation was performed. In only 82 are the necessary data available, and we find that, of these, 50 recovered from the operation and 32 died. In the 50 recoveries, the average interval which elapsed between the onset of symptoms and the radical operation was $4\frac{1}{2}$ months; in the 32 fatalities, the average interval was four months. Recovery is noted in a case where the interval was as long as fourteen months, and death occurred in more than one case where the interval had not been longer than one month. It is possible that the true clinical guide to the degree of malignancy may lie in the length of time which elapses between the termination of the last pregnancy and the appearance of the first symptoms of the disease. Certainly a large proportion of the most malignant cases have run continuously or almost continuously with the preceding puerperium.

It follows from all that has been said that the duration of the disease and the expectation of life are very difficult to determine, and are subject to very wide variations. The mode of termination is by weakness from repeated haemorrhage, by general dissemination, or by sepsis, and often, probably, by the two combined. In the cases accompanying perforating hydatidiform mole, death from haemorrhage following spontaneous perforation of the uterus has been noted.

X. Treatment.—A treatise on the treatment of disease by a pathologist may seem inappropriate, but from what has been stated, it follows that chorionepithelioma presents so many biological peculiarities, and differs so greatly from other malignant tumours, that the treatment of it must to an unusual degree be grounded upon our knowledge of its pathology. The initial difficulty, upon which too much emphasis can scarcely be laid, is that of diagnosis, and it is clear that mistakes are unavoidable; but, in view of the moderate mortality of hysterectomy in favourable cases, and the extreme danger of the tumour if untreated, it is better that a few uteri should be removed and found not to contain tumour, than that operation should be delayed, in the hope of obtaining absolute certainty in the diagnosis, until it is too late. The principal considerations are as follows:

(1) Neither clinically, nor histologically, have we any absolute criterion by which we can distinguish retained placenta, either with or without septic infection, from a commencing chorionepithelioma. Hydatidiform mole presents still closer

resemblance to the tumour, but in the diagnosis of it we are probably upon surer ground.

(2) All grades of malignancy are met with, but the highly malignant and rapidly progressing type is more common than in almost any other class of tumour. This high malignancy is due partly to the rapidity with which metastatic growths are established in the internal organs; but, on the other hand, local recurrence after operation is unusual, and the tumour in many cases can be diagnosed while it is yet strictly limited to the cavity of the uterus, the tumour which disseminates early being only one type of the disease.

(3) Chorionepithelioma also is one of the tumours in which removal of the primary growth undoubtedly exercises a favourable influence upon the secondaries, enabling the protective mechanism of the body successfully to deal with them. The three cases in which spontaneous recovery from fully developed tumour has taken place cannot be regarded as of much practical importance, being rather of the nature of miracles; but, the disappearance of secondary tumours where operation was necessarily incomplete has been quite commonly observed or inferred, and both the fact, and the nature of the process, have now been demonstrated histologically.

(4) Once the diagnosis of chorionepithelioma has been established it is clear that radical operation, *i.e.* panhysterectomy with removal of both Fallopian tubes and both ovaries, is the only possible treatment, and, here again, valuable indications can be obtained as to the mode and extent of the operation which should be performed. The thesis is established that there is a danger of causing the loose intra-venous growth to be dislodged into the circulation, and the violent course of the disease sometimes seen after operation has been set going in this way. Therefore, measures ought to be taken to control the veins where possible at the beginning of the operation.

(5) Infection of the lymphatic glands is so rare as to be negligible.

(6) As indicated in a previous section, recurrent haemorrhage after abortion or confinement calls for exploration of the uterus, and thorough clearing out should be made and the material submitted to the pathologist for microscopic examination. The cases of chorionepithelioma are so rare compared with simple conditions that the risk of producing dissemination need hardly be considered unless the symptoms are definitely suggestive of tumour. In many of the latter cases the discovery of the vaginal metastases may obviate the necessity for the curetting. Violent and dangerous haemorrhage is so commonly the result of interference that, before exploring a case of suspected chorionepithelioma, preparations should be made for an immediate hysterectomy.

(7) In the case of hydatidiform mole thorough clearance of the uterus will

generally result in the disappearance of the symptoms. In some cases in which they have recurred, a second examination has shown no great increase of growth, and further treatment on the same lines has proved satisfactory. If there has been a rapid re-formation of tumour, however, a radical operation should be performed. There is, in our opinion, no justification for the suggestion that every case of hydatidiform mole should be regarded as probably the precursor of malignant tumour, and radical operation performed upon that suspicion.

(8) After curetting, the patient should be kept under observation for many months, for, in a certain proportion of cases, the symptoms have gone into abeyance completely, or almost completely, for a long time. From the point of view of prognosis it is also important not to forget that the uterus may heal completely while secondaries, which have already been established, may progress with fatal result.

As to the choice of operation, that will depend largely upon the state of the patient and the stage at which the disease is diagnosed. The statistics show that the immediate mortality after operation, owing to the weak condition to which the patient has commonly been reduced by haemorrhage, is higher than that of other hysterectomies; but, there are many records of recovery where the conditions appeared desperate. As regards the further prognosis, the absence of local infiltration of the surrounding tissues is a favourable feature which can be set against the tendency to the formation of metastatic tumours in the neighbouring veins. Vaginal nodules should always be looked for both at the original operation and at succeeding examinations, and excised when found. They do not necessarily indicate that the lungs also have been infected. Where there is a reasonable chance that the condition is still confined within the uterus, simple hysterectomy is probably the correct operation, and measures should be taken to control the venous circulation at an early period. In all cases where rapidity is not the main indication it is advisable to investigate the para-uterine veins, and the operation recommended by Hitschmann and Cristofolletti is the same as that employed in excising the veins in cases of puerperal thrombo-phlebitis. Owing to the absence of local infiltration and particularly the absence of lymphatic infiltration the Wertheim operation is not necessary. Finally, it may again be emphasized that it is probably safer not to strive too much for complete removal of the venous extensions, for these, while undoubtedly originating in tumour, have often been reduced to simple thrombi by the clotting of the blood depriving the tumour-masses of their source of nourishment so that they disappear spontaneously; and that no patient need be refused operation on account of the presence of secondary growths who appears at all capable of standing it.

BACKWARD DISPLACEMENTS OF THE UTERUS

By Professor W. W. CHIPMAN
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THE subject of 'uterine displacements' has hitherto developed no definite doctrine; its teaching remains still unsettled and unsatisfactory. There are many conflicting opinions, for even as regards the number of these 'displacements' there is no unanimity of belief. The importance of the organ itself, the many vicissitudes of its life-history, and its special psychological relationships, tend always to complicate and confuse the subject. It is only recently that a definite perspective, or a correct proportion, is coming to be established.

More careful and systematic investigation has shown that the uterus is essentially a part of the pelvic floor—a specialized part, it is true—and that only as part of this floor is it in this connection to be considered. A 'uterine displacement' means of necessity some disturbance in this pelvic floor.

As regards the normal position of the uterus, certain arbitrary and narrow limits have hitherto been accepted as part of the uterine tradition, and any transgression of these circumscribed limits has been regarded as abnormal or pathological. A wider and more intimate knowledge has discovered that these limits are too narrow; that within the performance of normal function, not only is there a wide range of uterine movement in any given subject, but that there is also a marked variation of position in different individuals.

While the foregoing is generally true of all displacements of the uterus, it is specially conspicuous in the case of the so-called 'backward displacement.' There is no subject in gynaecology about which so much has been written, and upon which there is so little agreement. In the last two years upwards of two hundred articles have appeared on this subject. Truly, a multitude of counsellors!

In dealing with this subject of "Backward Displacements of the Uterus" I

shall first present some general considerations. These are: (1) consideration of terms; (2) considerations in development; (3) the supporting structures of the uterus, with some points in the anatomy of the pelvic floor.

General Considerations

1. Consideration of Terms.—A 'displacement of the uterus,' strictly speaking, refers only to a departure of the whole organ from its normal place or position; to those cases solely where the whole uterus is displaced. Accordingly, in exact phraseology, a 'backward displacement' means that the whole uterus is placed too far backward, that it lies altogether behind the pelvic axis; it is, in fact, retroplaced. In a healthy pelvis such a backward displacement has no pathological significance; it is primary, extremely rare, and demands no interference.



FIG. 307.—Retroposition or retrodisplacement of the uterus.

In by far the greater number of cases this retrodisplacement is secondary, the result of pelvic neoplasm, or disease. Inflammatory lesions behind the uterus may draw the whole organ backward, retroplace it; a neoplasm, or an inflammatory exudate in front of the uterus, may

push it backward. In all such cases the displacement is secondary, and its treatment is, of course, the treatment of the lesion which produces it. This is all that need be said of these true 'backward displacements.' One such primary case is represented (Fig. 307).

The term 'backward displacement' has come to include other variations, not only in the position of the uterus, but also in the direction of its axis, and even in the disposition of its component parts. Such variations are made to include by far the greater number of these displacements. It is these several variations that we shall now discuss.

Retroversion or Retrodeviation of the Uterus.—This is the commonest of these

variations (Figs. 308 and 309). Here there is a change only in the direction of the long axis of the uterus; for the body of the uterus is merely rotated backward behind the axis of the pelvis. In a case of simple retroversion there is in a strict sense no displacement of the uterus; for, while the fundus uteri swings backward behind the pelvic axis, the cervix uteri, save in the rare instances of extreme flexion, moves correspondingly forward in front of the axis. The more fixed portion of the uterus at the base of the broad ligament retains its usual, or axial, position, and behaves as a fixed transverse axis upon which the uterus as a whole rotates. The condition



FIG. 308.

FIG. 308.—Retroversion or retrodeviation of the uterus.



FIG. 309.

FIG. 309.—Retroversion or retrodeviation of the uterus. The backward inclination is more marked than in Fig. 308, but the uterus remains at a good level in the pelvis.

accordingly, is a rotation of the organ, and not a displacement; and it is best understood as a retrodeviation, or a retroversion of the uterine body.

It is essential to realize that such a retroversion of the uterus is very frequently a normal condition. It has been estimated that it is present in from 20 to 25 per cent of healthy women. In these women a uterus so deviated efficiently discharges the duties of menstruation, pregnancy, and parturition, and occasions no symptoms whatever. It is frequently only discovered in the course of a routine examination, and, therefore, must be considered normal to the individual in whom it occurs. To name such a variation in the direction of the uterine axis as a 'backward displacement,' is extremely misleading and unfortunate. Not only is it actually untrue, but

it also grossly exaggerates the position of affairs in the pelvis, not only in the mind of the patient herself, but also as it affects professional teaching and treatment.

Flexion of the Uterus.—A flexion is always of secondary importance, and, no matter how extreme the degree, is never to be designated as a displacement.

A retroflexion is rare in a nullipara, though it does occur. An antelexion is the rule here, and it is an expression only of asymmetrical growth of the walls of the uterus. Retroflexion associated with retroversion is comparatively common in parous women. It is a result of the loss of tone in the fibro-muscular wall of the

uterus, and in its so-called peritoneal 'ligaments.' In these cases the cervix uteri remains comparatively well upheld by the *essential* uterine supports, whereas the weakly-supported retroverted body suffers more pronounced descent; hence, the uterus bends at the isthmus where the walls are thinnest. The flexion is an expression of unequal descent in the two parts of the uterus. It is common to find it in puerperal conditions, where involution, for any reason, has been delayed or is incomplete.

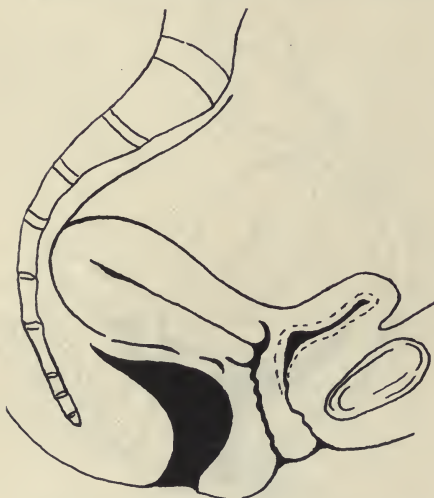


FIG. 310.—Retroversion and prolapse of the uterus. The displacement is not so much backward as downward. (Compare Fig. 309.)

Flexions, the result of tumour-growth or of causes extrinsic to the uterus, are not considered here.

Retroversion and Prolapse of the Uterus (Fig. 310).—A degree of prolapse is a common variation in the position of the retroverted uterus, and the two, the retroversion and the prolapse, are frequently confounded. In the estimation of any 'backward displacement' the retroversion of the uterus must be carefully dissociated from this prolapse or descent.

A uterus in retroversion should be at the same general level in the pelvis as a uterus in anteversion; and to the same degree that it is below this level, it suffers from descent. The one essential thing is always the maintenance of this proper level, for a retroversion will give rise to no symptoms provided there is no prolapse.

It is quite true that a uterus in retroversion is disposed at a disadvantage in the pelvis. As we shall see later, its utero-ischial or true utero-sacral ligaments are

longer than they are in anteversion, and hence their supporting strength is less. Moreover, in retroversion there is no subjacent bladder with its strong fascial support, to distribute and to help to carry the downward stress; it is disposed at a disadvantage to the force of gravity, for its long axis comes to lie in the axis of the vagina; and a comparatively larger area of its anterior surface is apposed to the intra-abdominal pressure. For these reasons there is in retroversion a greater liability to descent. A retroverted uterus is, in and of itself, not a displaced uterus, but it is certainly more prone to become displaced; and the displacement to which it is specially liable is that of prolapse.

It is in this descent, or prolapse, that the retroverted uterus passes from a normal to an abnormal position, for it is just where it begins to descend, to sink down in the pelvis, that it will be found to give rise to symptoms. And these symptoms, it is to be observed, are due, not to the retroversion but to the prolapse.

The Normal Position of the Uterus (Fig. 311).—It is true that in about 75 per cent of healthy women the uterus lies with its fundus slightly in front of the pelvic axis, in the position of anteversion, and with the body of the uterus curved slightly forward on the cervix. In the erect posture, this uterus is nearly horizontal in



FIG. 311.—The anteverted uterus in its normal position.

position, and its correct level in the pelvis places the fundus just above the symphysis pubis, and the external os opposite the ischial spine. This is generally regarded as the normal position, and departure therefrom is apt to be considered of the nature of a displacement. In respect of the mere direction of the fundus this limit of normality, as I have already indicated, is too restricted, for, even though the fundus uteri lie behind the pelvic axis it may still be considered normal in position. Wherever the fundus lies, however, the one essential condition of normality is the maintenance by the whole uterus of its proper level.

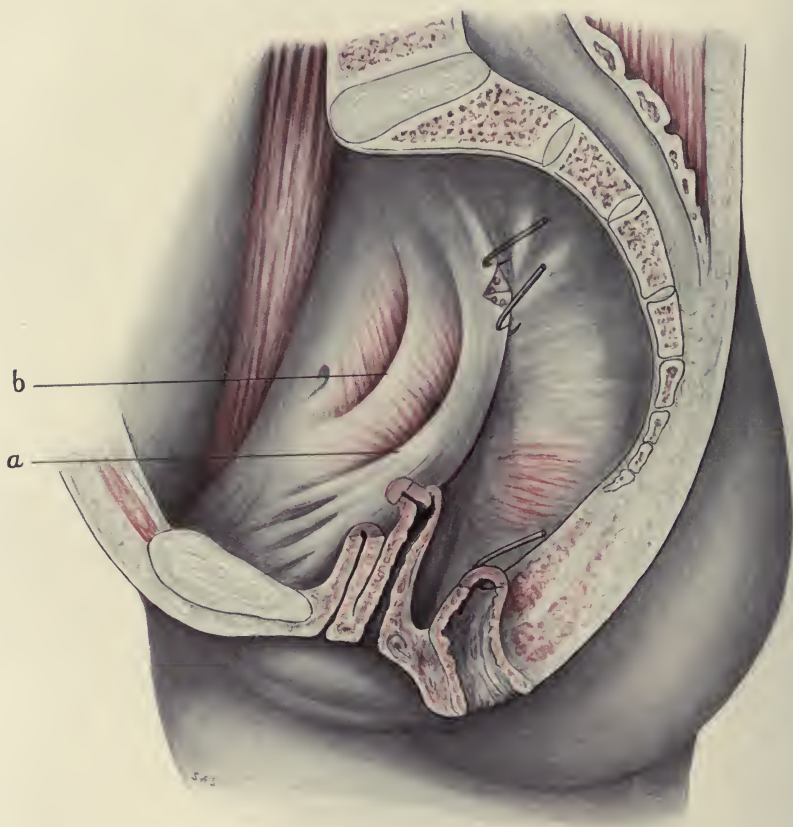
2. Considerations in Development.—The explanation of the varying inclination of the body of the uterus to the axis of the pelvis, is found in individual variations of development and growth. The genital canal, within limits of normal function, shows in different individuals considerable variation in its position, direction, and the proportionate length of its component parts. Such variations underlie the

whole evolutionary process, and are to be considered normal to the individual in whom they occur. These variations are due to: (a) variations in the development of the canal itself; (b) the struggle for room of the growing pelvic viscera, (c) the developmental variations of the supporting fibrous tissue and muscles of the pelvic floor.

It is necessary to add only a word or two of explanation as to (a) the variations in the development of the canal itself. If, at its formation, the genital cord, instead of occupying its usual position in the axis of the pelvis, is placed in front of this axis, the uterus and vagina will in consequence lie closer to the symphysis pubis. The utero-vesical pouch will be small, and the anterior vaginal wall correspondingly short. In such cases the vagina opens farther forward in the cloaca, and the perineum is unusually long. Under these conditions, in its subsequent upward growth before puberty, the body of the uterus will almost of necessity be inclined backward; there is no room for it in front of the pelvic axis, and so it becomes inevitably, 'congenitally' retroverted. Such a condition is found in about 25 per cent of healthy women. The variation falls within the limits of the normal, and is of no special clinical significance, provided that the supporting structures of the uterus and vagina are well preserved. Accordingly we are to regard a retrodeviation, a simple retroversion of the uterus, as a normal position. The essential, the all-important fact, is that the uterus as a whole should be maintained at its proper level in the pelvis. Provided this proper level is preserved, it matters little whether the fundus uteri lie in front of the pelvic axis or behind it.

3. The Supporting Structures of the Uterus, with some Points in the Anatomy of the Pelvic Floor.—The *effective* supports of the uterus are subperitoneal, and are developed from the undifferentiated mass of mesenchyme, which in the embryo surrounds the genital cord. These supports are designed to carry the weight of the abdominal viscera, which is normally transmitted to them; and they are not to be confused with the folds of peritoneum attached to the uterus. These peritoneal folds, though they are commonly designated 'ligaments,' contain only non-striped muscular fibre, and connective tissue, and they are accordingly quite incapable of bearing continuous strain. They are really derivatives from the primitive inguinal folds, and are related genetically to the muscular wall of the uterus. They function as *guys*, or *stays*, for the uterus, but they are unequal to holding it in position when the effective supports are impaired. At the most they may be called the *accessory* supports of the uterus.

The effective supports, on the other hand, are fibrous, and they form a veritable hammock, or diaphragm, which firmly grasps the urethra and vagina where these



Sagittal Mesial Section of the Pelvis to show the right half of the fibrous hammock of the pelvic floor. The peritoneal lining of the pelvis has been completely removed; the bladder, body of the uterus, and rectum are not shown. (a) Arcus tendineus fasciæ pelvis; (b) Arcus tendineus musculi levatoris ani (the 'white line').

pierce it, which underlies the bladder, and closely surrounds the supravaginal portion of the cervix uteri. This fibrous hammock constitutes the true pelvic floor, and is the essential, the chief support of the pelvic viscera. It provides the fixed attachment of the uterus. Above the level of this fixed attachment, the uterine body is steadied only by peritoneal folds, its guys, or stays; hence, this body has a wide range of mobility within normal limits, and is free to expand and retract during pregnancy and labour. According to the description of A. Campbell Geddes this fibrous hammock, which constitutes the true pelvic floor, may be divided into the following parts:

(1) The *arcus tendineus fasciae pelvis*, a stout, bowstring-like structure, attached anteriorly to the back of the body of the pubis, usually by three or four processes, and posteriorly to the ischial spine with direct extensions to the sacral ala, and indirect extensions through the substance of the lesser sacro-sciatic (sacro-spinous) ligament, to the sides of the last two sacral and first coccygeal segments. This structure must be distinguished from the *arcus tendineus musculi levatoris ani* (the 'white line'), which, when present, provides a lateral origin for the levator ani muscle. It not infrequently happens that the two arcs coincide in position; they may be adherent to one another, but, if so, are separable (Plate XXVIII.).

(2) The central part of the fibrous hammock or diaphragm of the pelvic floor sweeps in from the *arcus tendineus fasciae pelvis* of either side to grip firmly in front the neck of the bladder, the upper part of the vagina, and the uterus at the level of the internal os, or the isthmus. This layer is known as the lateral pubo-vesical ligament. That part of the layer which passes in front of the bladder to blend with its fellow of the opposite side is called the pubo-vesical ligament, while the part between the urethra and vagina is known as the urethro-vaginal ligaments. No name has been given to the posterior part which grasps the vagina and uterus. It cannot be too strongly emphasized, however, that these variously named and unnamed ligaments are parts of one structure, the fibrous sling of the pelvic floor. This fibrous sling or hammock exists to carry the weight of the abdominal and pelvic viscera, and to save the muscular pelvic diaphragm from this unremitting strain. How firmly this fibrous structure must grasp the walls of the fibro-muscular tubes which perforate it is self-evident.

(3) A third part of this fibrous sling or diaphragm consists of a sheet of fascia (in the erect posture set almost vertically) which extends from one ischial spine to the other across the mid-line. Along its superior concave margin it is continuous with the posterior edge of the fascial sheath described above, but its inferior edge is attached laterally to the fascial lining of the pelvis and mesially to the perineal

body. It is known as the recto-vaginal fascia, and forms the anterior boundary of the rectal channel.

The projecting edge or shelf formed by the junction of the two sheets of fascia (2) and (3) is very strong, and is placed almost vertically. This is the suspensory ligament of the uterine cervix and vagina. It is the chief support of the uterus, and it creates and maintains the vaginal fornices. Mackenrodt's *ligamenta transversa collis* are parts of this structure; so are the fibrous sheaths accompanying the uterine vessels, which lie between the fascial layers of this suspensory ligament; also to be included here are the utero-ischial, or true utero-sacral ligaments. These pass beneath the ureters, and are wholly distinct from the peritoneal folds of Douglas, with which they are frequently confounded.

As regards the uterus and vagina, the utero-ischial or the utero-ischio-sacral portion of this ligamentous hammock, or diaphragm, is the one that affords the chief support. When the individual is upright, its fibres pass nearly vertically from the sacrum and the ischial spine to the uterus and vagina; it suspends them.

In the cases of primary, or 'congenital' retroversion, where the lower segment of the uterus lies forward in the pelvis, these essential suspensory ligaments of the uterus and vagina are of greater length, and are in consequence of diminished strength. Longer and weaker, they are nevertheless subjected to the greater strain of a uterus in retroversion, and so it is that a retroverted uterus is more liable to prolapse.

This fascial hammock or diaphragm is the pelvic floor; below it are the various muscles which close the pelvic outlet. These muscles for the most part surround the several openings of urethra, vagina, and anal canal, and are largely sphincteric in action. To this group belong the levator ani and the coccygeus muscles. They afford a certain measure of support when subject to intermittent strain, and so may be called accessory supports of the pelvic viscera.

As regards the uterus, then, its essential support is the fibrous sling of the pelvic floor. Above there are the accessory supports of its peritoneal folds, or 'ligaments,' and below, the accessory support of the muscular layer of the pelvic floor (Fig. 312).

The following is a broad and general conception of the position of the uterus and the nature of its supports. The uterus may be considered as sitting in a swing—the fibrous hammock of the pelvic floor. The uterus sits, as it were, in this hammock which is attached to the uterus at the level of the isthmus. The uterine body above the seat of this swing is clothed in peritoneum, and is steadied by peritoneal folds, or guy-ropes. These are the broad ligaments on either side, the folds of Douglas behind, and the utero-vesical and the specialized ovarian ligaments (or the round ligaments) in front. The cervix uteri projects below the level of this seat, and hangs

freely within the vaginal vault, since the vaginal fornices are also supported by the fibrous sling. Now, below the uterus, and closing the pelvic outlet, is the so-called muscular layer of the pelvic floor. This affords, as it were, a foot-rest to the uterus seated in the swing. The analogy is that of a person seated in a swing, steadied therein above, and with a definite foot-rest below.

This, then, is the true conception, I believe, of the pelvic floor and the various supporting structures of the uterus. The uterus sits in this swing, usually with the fundus lying forward of the pelvic axis, though, as we have seen, it may be inclined backward behind the axis. Either position is normal to the individual in whom it

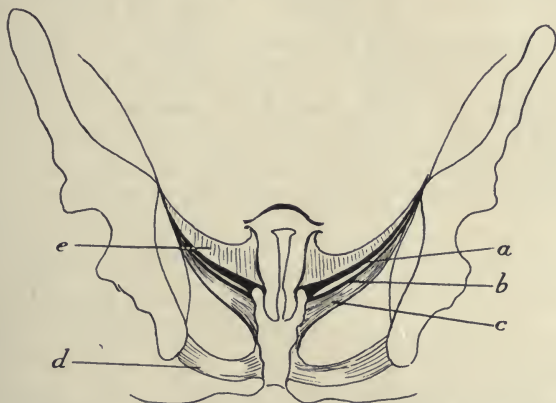


FIG. 312.—Coronal mesial section of the pelvis (diagrammatic) to show the fibrous hammock, or diaphragm of the pelvic floor, and its attachment to the uterus and vagina. The accessory uterine supports, above and below, are also indicated.¹

- (a) The fascial hammock, the essential, or true, uterine support; (b) the recto-vesical fascia; (c) the levator ani muscle; (d) transversus perinei muscles; (e) the peritoneal 'ligaments.'

occurs, provided that the essential support, the fascial hammock, be strong and unimpaired, and the whole uterus be held at a normal level in the pelvis. The uterus is always to be regarded as a mobile organ, and with a comparatively wide range of normal movement. This movement is chiefly one of rotation about the transverse axis of the seat in which it sits. It is determined largely by the condition of the adjacent viscera; for example, a full bladder rotates it backward, a full rectum, on the other hand, inclines it forward; the position of the individual also affects it. This movement of rotation is controlled largely by the peritoneal stays, or guy-ropes.

The uterus so considered is part and parcel of the pelvic floor, and simply shares in the vicissitudes of this floor.

¹ Compare also Article on Anatomy, Figures 16 and 19 (Vol. I. pp. 17 and 35).—EDITORS.

Intra-abdominal Pressure.—It is to be remembered that the portion of the uterus which projects into the peritoneal cavity, that is, the part covered by peritoneum, is subject to the effects of intra-abdominal pressure. This pressure acts at right angles to the plane of the surface, and equally, upon the whole area exposed, whether above or below. It surrounds the free uterine body with a pressure similar to a fluid pressure, and its effect upon the position of the free, 'floating' uterine body is only indirect, and to be expressed in terms of its pressure-results upon the whole pelvic floor.

Gravity.—The uterus, on the other hand, has a distinct weight of its own, and is subject like all else to the force of gravity. When the fundus is retroverted the bladder, with its strong ligaments, is no longer subjacent, and hence a greater strain falls upon the special uterine supports. In this position of retroversion it is the force of gravity, the weight of the uterine body, which drags upon its accessory peritoneal supports. When the fundus lies behind the plane of the utero-ischial, or true utero-sacral ligaments, the weight of the fundus must be in part supported by these accessory peritoneal ligaments, and in part by the muscular tone in the wall of the uterus itself.

From the above considerations it is also clear that a uterus, upright or even anteverted, when it begins to descend, or prolapse, comes gradually to occupy the position of retroversion; for a stretching or dislocation of its utero-ischial ligaments permits the cervix to pass not only downward but forward into the vaginal axis. As the cervix passes forward the fundus uteri tends to swing backward, and a continuous strain is so thrown upon its peritoneal guys, or stays; these now inevitably yield, and so it comes to be that the first stage of a prolapse is frequently a retroversion. Figuratively, it may be stated that a uterus, 'congenitally' retroverted has taken, as it were, the first step in its downward path, and here as elsewhere it is always the first step that counts. Hence it is that a retroverted uterus throws special strain upon its supports, and requires through the lifetime of its possessor greater care and consideration.

Summary of General Considerations.—'Backward displacements' include not only true retropositions of the uterus but other variable conditions.

A simple retroversion of the uterus is one of these conditions, and it may or may not be accompanied by flexion. Where it occurs 'congenitally,' it is a normal variant of the uterine axis, and in and of itself is not a displacement.

A retroversion of the uterus is frequently associated with a degree of prolapse, and the two constitute the commonest form of backward displacement; this backward displacement is in reality a downward displacement.

The uterus is an essential part of the pelvic floor, and any alteration in its

position means some variation or disturbance in this floor. The most frequent disturbance is of necessity a prolapse, which is in all essentials a hernia.

Frequency

Comprehensive and reliable statistics are difficult to obtain. Various estimates have been given, but from the very nature of the condition these are frequently but inferential. It is generally admitted that in healthy nulliparae the uterus is found retroverted in from 18 to 25 per cent of the cases. This may or may not be too large a proportion, but the fact is indisputable that it frequently is present, and present in individuals who complain of no symptoms.

W. J. Mayo goes a step further and states¹ that it must be acknowledged that in at least 25 per cent of women 'retroposition' exists.

E. Schroeder reports 411 cases, in which 188, 28.7 per cent, had retroversion of the uterus; of this number one quarter was free from symptoms. He contends that uncomplicated retroversions of the uterus produce no symptoms, and that, where there are symptoms, other lesions must be present.

Wormser asserts that simple retroversion is common, but in healthy women it produces no symptoms; he draws special attention to the importance here of a hypersensitive, or deranged, nervous system.

Such statistics as those of Winckel, Lohlein, and Sanger, wherein it is shown that a retroversion of the uterus occurs in 17.74 per cent of all cases of pelvic disease, are of course of little value. For frequently in these conditions the backward displacement is of necessity the result of the disease.

Austin Flint, jun.² found the puerperal uterus retroverted in 15 per cent of a series of his cases in private practice, and in 26.4 per cent in a second series of hospital patients, with an average for both of 21.3 per cent. The series he presents is small, and there is no record of the previous position of the uterus.

Etiology

The condition may be primary, resulting from variations in development or growth. In these primary cases the uterus will remain always retroverted, and it later may become flexed, or even as a whole prolapsed.

It may be secondary or acquired. In these cases the retroversion is always associated with a degree of prolapse—it is indeed the first step of this prolapse. For

¹ *Journ. Amer. Assoc.*, October 19, 1912.

² *Amer. Journ. Obstet.*, July 1914.

the utero-ischial, or true utero-sacral ligaments, have been stretched or dislocated, and so allow the cervix uteri to sink downward and forward in the pelvis. The forward descent of the cervix deflects the uterine body backward, and so its weight comes to drag continuously upon the upper secondary supports, the peritoneal 'ligaments.' It is the yielding of these primary and secondary supports which leads to the retroversion and prolapse. Hence this backward displacement is liable to occur after child-birth, and especially if the labour has been difficult or complicated.

Subinvolution, from whatever cause, is prone to produce it. It is always to be remembered that the peritoneal 'ligaments' share specially in this slow or defective involution. The displacement itself is often a cause of subinvolution, and so in many instances a 'vicious circle' is complete. Puerperal infections and severe haemorrhage are potent factors here, while a persistent dorsal decubitus accentuates it.

Apart from child-birth, it may result from the infliction of severe and undue stress upon the pelvic floor; the heavy and prolonged work of laundry-maids or pit-brow workers affords special instances of this. An injury, such as a fall, is often blamed, but it is usually difficult in such cases to ascertain whether or not the condition did not previously exist. Obesity and wasting disease are factors in its production, and associated with enteroptosis it is sometimes an expression of a general anaplasia.

Displacements due to neoplasms or pelvic disease are of course not included here.

Complications

A simple retroversion will give rise to no complications, provided that the whole uterus and its appendages be maintained at the usual, or normal, level in the pelvis. If, however, the uterus in whole or in part, or its adnexa, sink to a lower level, complications are likely to ensue.

These complications, in the first instance, assume the form of a passive congestion, the result of the impeded return of the venous blood from these organs. The veins in the broad ligament are large, thin-walled, and possess few valves. While a simple rotation backward of the uterine body can of itself scarcely occasion pressure upon, or torsion of, these veins, if there be any degree of prolapse this condition may be produced. Even in a slight prolapse the force of gravity alone, in the lengthened and more upright veins, would be a factor in the impediment. Whereas in acquired retroflexion, where the fundus is at a lower level than the cervix, the large

lateral uterine veins will press against, ride across as it were, the true utero-ischial ligaments, and a definite degree of pressure-occlusion of these veins will result. This is specially prone to occur in the puerperal uterus where the essential supports have been to some extent stretched or dislocated, and where the heavy body sinks backward and downward in a definite flexion between the sharp borders of these supports. The bend in the uterine wall itself is not a causal factor, for as Hyrtl and Sir John Williams have shown, each and every transverse segment of the uterus has its own vascular supply; the impairment in the circulation is altogether extrinsic to the uterus.

The results of this passive congestion are the production of a chronic oedema, with hypertrophy and hyperplasia, both in the mucosa and fibro-muscular wall of the uterus. In this way is produced a chronic 'endometritis' and 'metritis' with the usual accompaniment, a cervical 'erosion.' In elderly women a retroflexion and prolapse is one of the contributory causes of pyometra.

The ovaries in retroversion are specially liable to prolapse. They no longer rest upon the upper surface of the broad ligament, as in anteversion, but here depend from its under surface, and so exert a downward traction upon their special attachments. In their turn they become oedematous and hypertrophic, and add their weight to that of the uterus. They may lie first in the pararectal pouches, or may sink at once into the pouch of Douglas, and so completely underlie the uterus.

A tubo-ovarian varicocele, especially marked in the veins of the pampiniform plexus, may also occur. In the last ten years I have encountered this condition seven times. In two cases the uterus was anteverted, and at a good level in the pelvis; in the remaining five the uterus was retroverted and prolapsed, and in three of the cases, contrary to common experience, the condition was found on the right side. Paul Petit¹ has well described this condition, and its effect upon the ovary.

In severe cases of retroversion and prolapse these conditions of oedema may lead to localized peritoneal irritation, and a subsequent infection, either haematogenous or directly from the bowel or Fallopian tube. The adhesions so formed may embrace both the uterus and its appendages, with attachment to the bowel and parietal peritoneum.

Symptoms

The signs and symptoms usually attributed to these 'backward displacements' are backache, with a feeling of weight in the pelvis; disturbance of the menstrual

¹ *Comptes Rendus de la Soc. d'Obstét. et de Gyn. de Paris*, May 1891.

habit—menorrhagia, metrorrhagia, dysmenorrhoea, and leucorrhoea; and to these must be added dyspareunia, sterility, and constipation.

And first it may be observed that all these symptoms and signs may be encountered with the body of the uterus in an ideal forward position; where, indeed, the bi-manual examination gives no evidence of any pelvic disease. The cause for the symptoms in these cases is in some general constitutional disturbance, a nervous instability, a depravity in metabolism, or some particular systemic disablement. The disturbance of the menstrual habit may be due to intrinsic causes within the uterine wall itself, or in its blood-vessels; and all these things may occur with the uterus in an ideal position. In this class of case the position of the uterus has nothing whatever to do with the trouble.

Again, the uterus may be retroverted, even to a marked degree, and yet there be none of these signs and symptoms.

There is no syndrome pathognomonic of 'backward displacements.' While a retroverted uterus with a degree of prolapse may, and frequently does, give rise to symptoms, it is imperative that each case should be carefully studied. The several systems should be always methodically examined, and the personal equation, as far as possible, estimated. The uterine 'displacement' may be the cause of the various troubles of which the patient complains, but on the other hand these troubles may be due to other conditions. As T. Watts Eden well observes: "In a considerable number of these cases the 'displacement' does not give rise to any ill effects."

If we analyse the signs and symptoms themselves the argument of *non sequitur* may be not infrequently established.

(a) *Backache*.—As La Rochefoucauld puts it, pain is the greatest liar in the world, but of all these painful liars we know that backache is the most perfect Ananias—or Sapphira. Backache is a large term and little is known of its etiology. It is the commonest disorder to which women are liable. Kelly says: "It is not often felt by either the young or the old, but seems rather to belong to mid-life, to the woman's active sexual period." The lumbar and sacral spine are the usual areas involved, but it is extremely difficult to classify, and often even to localize. It is a common symptom in all neurasthenias and myasthenias. Undue pressure or strain upon the deep fascial planes or inter-osseous ligaments, for example, in lordosis, in enteroptosis, or pendulous belly; toxic conditions of faulty metabolism or infections—gout, rheumatism, or neuralgias; bowel-stasis, and constipation: these may all produce intense and persistent backache. Goldthwaite's work has demonstrated that sacral pain is not infrequently due to some degree of luxation in the sacro-iliac joints, and he contends that in all backache this condition is to be first sought for and

excluded. Kelly says again: "My own experience teaches me that a backache is not often directly dependent upon any pelvic disease, for patients with aggravated pelvic ailments, where we would most expect backache, often do not complain of it, and that the mere correction of a minor pelvic ailment, apart from the care of the general condition of the patient, frequently does not relieve the pain."

I do not forget the fourth sacral nerve, and its distribution to the uterus and upper genital tract. There is no doubt that pressure upon, or stretching of this nerve will produce sacral pain, for we find it in inflammatory mischief, and in cancerous growth. Associated with the dragging pain felt in the side, this sacral pain is also present in most cases of prolapsus uteri, whether the uterus be anteverted or retroverted. I have never met it in an uncomplicated case of retroversion where the uterus preserved its normal level.

We conclude that backache is a wide term, and that in its etiology there are many and manifold causes. Uterine conditions of any kind are only one of these causes. It is wise, unless there be a gross lesion in the pelvis, carefully to exclude conditions outside the pelvis which may produce it. The only uterine 'displacement' which will produce backache is, in my experience, one that causes an irritation to its nerve supply, and that is a degree of prolapse.

(b) *Disturbances of the Menstrual Habit.*—Menorrhagia, metrorrhagia, dysmenorrhoea, and leucorrhoea. Here we are concerned with the vexed question of uterine congestion. As we have seen, there are mechanical factors which may give rise to this condition. The valuation of these several factors, clinically, is always a matter of considerable experience and judgment. It is true that a retroversion, when accompanied by flexion and prolapse, may provide an adequate etiology for this uterine congestion with its attendant syndrome. This mechanical pathology is most conspicuous in the puerperal uterus, where a subinvolution, with all its accompanying signs and symptoms, is thereby aggravated and prolonged. The mechanical pressure of the lateral uterine veins, against the utero-ischial ligaments, is undoubtedly a large factor in the maintenance of the uterine congestion.

It should never be forgotten, however, that passive congestion is a condition extremely difficult to measure or to estimate by any signs and symptoms. Hypertrophic conditions of the uterine mucosa, or intrinsic changes in the wall of the uterus itself, or in its blood-vessels, may produce all the signs—the menorrhagia, the dysmenorrhoea, and the leucorrhoea of the so-called uterine congestion. And all these symptoms and signs may occur, be it emphatically observed, with the uterus ideally forward in position.

As regards dysmenorrhoea, the most severe pain, associated with menstruation,

occurs in those cases of imperfectly-grown, acutely anteflexed and anteverted uteri, associated with late and scanty menstruation. This condition is in many respects the exact opposite of the one under discussion. The dysmenorrhoea of inflammatory lesions in the uterine wall, or of its adnexa, have little or no relation to the direction of the fundus ; and it is only when inflammatory lesions are associated with, or result from, a retroversion of the uterus, that this displacement gives rise to dysmenorrhoea.

It is true that an ovary which is prolapsed, and is subject to the pathological changes of oedema, hypertrophy, and hyperplasia, and the subsequent sclerosis, may occasion, at the time of menstrual congestion, a dysmenorrhoea. In my experience, however, such an ovary is more liable to occasion an ovulation-pain, the 'interval-pain' that is sometimes met in these cases. This condition is, however, comparatively rare.

(c) *Sterility*.—The whole question of impregnation presents many factors, both known and unknown. I confess that I am extremely sceptical as to a retroversion of the uterus, in and of itself, being a cause of sterility. If the uterine mucosa is healthy, the direction of the fundus can in no way affect the embedding of the ovum. In the matter of insemination, it is generally admitted that a first pregnancy frequently occurs without a complete penetration of the hymeneal orifice ; and hence, in the cases of retroversion, the inclination forward of the cervix, and the consequent withdrawal of the external os from the seminal lake in the posterior fornix can have but a theoretical determination. It is true that I have 'replaced' such retroverted uteri for sterility, either by operation or by manipulation and a pessary ; and in a few such cases conception has occurred. In the greater number, however, the sterility has continued. Moreover, some of the most stubbornly prolific women that I have known are possessed of permanently retroverted uteri. I believe that if a woman does not conceive with a healthy uterus in retroversion, the chances are that she will remain sterile even with this uterus anteverted. An 'endometritis,' either cervical or corporeal, the result of passive congestion, may result, as we have seen, from a retroversion with a prolapse. When this mucosal condition is present, it may be the cause of the sterility, and is always to be appropriately treated.

(d) *Dyspareunia*.—Excluding conditions at the *introitus vaginae*, the most frequent cause of a dyspareunia is a utero-sacral cellulitis. In this inflammatory lesion the uterus is retroposed, and almost of necessity is anteverted and anteflexed. This particular pain occurs, it is true, in a retroversion of the uterus where the ovaries are prolapsed, and lie in the pouch of Douglas beneath the uterine body ; but it is never severe, save there have occurred an inflammatory exudate, and the fixation of these organs by adhesions.

(e) *Constipation*.—That a uterus which is merely retroverted will, by its mechanical pressure upon the rectum produce constipation is, I believe, an unwarranted assumption. In this connection there are two things to be remembered: (1) the comparatively insignificant weight of the uterine fundus, say 1 oz., which alone presses upon the rectum; and (2) the supporting, or buoyant, effect upon the under surface of the uterus, of the intra-abdominal pressure, when, as is so frequently the case, coils of small bowel lie beneath the uterus in the pouch of Douglas. It is true that in the circumstances of retroversion and prolapse, where the uterus lies upon the floor of the pouch of Douglas, the uterus is then subjected only to the downward thrust of the intra-abdominal pressure, for no bowel lies beneath it; this downward thrust, together with the weight of the organ, may exercise an appreciable effect upon the lower rectum. Again, however, it is the prolapse that is the actual factor in the bowel-pressure.

In the matter of all these signs and symptoms so frequently ascribed to retroversion of the uterus, this 'backward displacement,' the situation may be fairly summarized, I think, in the following way. All these signs and symptoms may be found with no retroversion whatever, for these may result from altogether different causes. Their presence is in no sense pathognomonic of this, or of any other uterine displacement, and so the displacement may be but a coincidence, and possess no etiological significance whatever.

In actual practice it is fair, I think, to regard retroversion of the uterus unaccompanied by prolapse, as of no importance, save only as a certain predisposition toward prolapse. It is specially wise in these cases to treat the symptoms of which the patient may complain upon general and broad lines; rather to avoid than encourage local treatment; and only if the general treatment fail—and this in my experience will rarely be the case—is one to attend in any way to the 'backward displacement.'

Above all things, it is important not to inform the patient with simple retroversion that she has a 'displacement' of her womb; for such information, while it is incorrect, loads her imagination for a lifetime with the burden of sexual deformity. To this deformity she will ascribe for the remainder of her life all pain and disability which she may suffer. There is no gainsaying the fact that, in the consciousness of its possessor, the womb is the most important organ in the whole body. It is the organ from which the woman's whole outlook on life is taken; and to her way of thinking there are no symptoms so grave and so far-reaching as those which are associated with it.

Diagnosis

The diagnosis of retroversion of the uterus can only be definitely made by a bi-manual examination. The internal examining finger may be introduced into the vagina, or into the rectum, or, the combined method may be used with one finger in each canal. The external or opposing hand palpates deeply the hypogastrium. The whole question is one merely of recognizing the uterine body, and of localizing its position. If the fundus uteri lie behind the axis of the pelvis, the uterus is retroverted; and if the body is bent backward on the cervix, it is also retroflexed. The several degrees of retroversion which are frequently enumerated are much more truthfully interpreted as degrees of prolapse or descent.

The vaginal finger notes first that the cervix is placed usually in front of the pelvic axis, and is in consequence easily accessible. In the 'congenital' cases the anterior vaginal wall is unusually short, and the anterior fornix is shallow. Through the posterior fornix the cervix uteri can be traced directly to the uterine body with no break in the continuity of the organ, and no appreciable difference in its consistence. In cases of flexion, a bend or curve is met by the examining finger at the level of the isthmus. The integral relationship between the cervix and the uterine body is ascertained from the fact that these two parts move together; the movement of the cervix producing always an answering movement in the body. Moreover, the body of the uterus can usually be determined by its pyriform shape.

These details are now verified by the bi-manual examination. In thin subjects, and where the abdominal walls are relaxed, it is possible to palpate the retroverted uterus between the two hands, and to outline it in its retroverted position. It is, however, impossible to grasp the uterus by its two extremities, as is so easily done in anteversion. Through the anterior fornix nothing can be felt save the bladder. As the examination proceeds, however, it is frequently possible, with the fingers in the posterior fornix, to lift the fundus upward and forward, and to place it in the position of anteversion whereby the diagnosis is rendered absolute. In such cases, as the body of the uterus is lifted up, the ovaries on either side can be distinctly recognized; they are always to be differentiated from scybalous masses in the rectum.

In difficult cases considerable help is derived from an abdomino-recto-vaginal examination, the middle finger being introduced into the empty rectum, and carried to a higher level along the posterior surface of the uterus.

For various reasons an anaesthetic may be advisable.

In unmarried women the abdomino-rectal examination is in every way preferable, and in many cases a vaginal examination is altogether unnecessary.

A sound may be passed into the uterine cavity only under the strictest aseptic precautions, and in the vast proportion of cases its employment is superfluous.

The healthy condition of the uterus and its adnexa are to be judged by three things: (1) the mobility of the organs—both the uterine body and its appendages are mobile, and are easily ‘replaced’; (2) these organs are normal in size, and preserve their usual consistence; (3) they are not unduly sensitive.

The estimation of the level of the uterus in the pelvis is always of special importance. In retroversion, the whole uterus is not infrequently in a distinctly low position in the pelvis; where retroflexion co-exists, the body of the uterus is usually lower than the cervix.

Differential Diagnosis.—A ‘fibroid tumour’ in the anterior or posterior wall of the uterus, similar in size and shape to the uterine fundus, may, especially in fleshy subjects, occasion considerable difficulty. In such cases an anaesthetic, with the aseptic introduction of a sterile sound into the uterine cavity, may be necessary in order to distinguish the uterine fundus.

Scybalous masses are always to be recognized by the introduction of the finger into the rectum.

A neoplasm of the adnexa, or an inflammatory exudate, can usually be distinguished from the uterine body by a difference in shape, and an inequality in consistence.

Treatment

The treatment is both non-operative and operative. A retroversion is, as we have seen, frequently a normal position of the uterus; there is no ‘displacement,’ and hence there is no indication whatever for local interference.

The crux of the pelvic situation is the level at which the whole uterus is maintained in the pelvic cavity. If this level be approximately a normal one, the whole uterus being supported somewhere near its usual position, the demand for local treatment, or interference, can be pronounced at once illegitimate; and this altogether irrespective of the testimony of the patient. It is also wise to remember that even here, as Thomas Addis Emmet long ago observed, the limits of normal level or position of the uterus in different individuals are not arbitrary, nor are they absolutely fixed; that there is, even in level, a considerable variation, which may fall within the ‘health-line.’

Of all the symptoms and signs which lead the patient to seek medical advice,

pain is by far the most frequent. And pain, as we have seen, is a most unreliable witness.

The special plea I make is that each case should be thoroughly studied upon broad and general lines, and that attention should never be solely concentrated upon the pelvis; but that the organism as a whole should be wisely proportioned and understood. "Woe to the specialist who is not a pretty fair generalist. . . ."

W. E. Fothergill has said: "While there is nothing more easy than to recognize the existence of a retroversion, there is nothing more difficult than to diagnose the exact relation of the retroversion to the symptoms and the other physical signs present in any particular case."

General Management.—The broad question of general management and treatment can best be indicated, I think, by the following detailed account of the medical history of an actual case of so-called 'backward displacement.'

A girl, aged 23, of indolent habit, of good build, flabby, and rather fat. The complexion was poor, and she was pale, emotional, and nervous. The complaints were that she was always tired, that there was persistent backache, that she suffered at her periods, had an obstinate leucorrhoea, and was constipated. The family history was good, and there had been no severe illness. As a younger girl, and while at school, she had taken more exercise, and was always well. Since her social advent, five years before, she had been increasingly troubled with the above symptoms, and for the past three years had been in indifferent health.

On examination the abdomen was negative, and the vaginal orifice showed no signs of infection. *Per vaginam no digital examination was made.* A recto-abdominal examination discovered a uterus of average size, but distinctly retroverted, the fundus lying behind the pelvic axis, and just below the sacral promontory. The organ was mobile, and its own general level in the pelvis and that of its appendages was well preserved.

Now this was definitely a case of so-called 'backward displacement,' and several of the classic signs and symptoms generally attributed to it were present.

However, I made no such pronouncement. To the patient herself I said nothing of the retroversion, but pronounced her pelvis healthy, as it certainly was. (I confided to the mother, however, the fact that her daughter's womb was inclined backward, and that while it might need special consideration, it was nevertheless a normal condition.)

I exhibited no local treatment whatever, but merely corrected the indolent social habits, and relieved the constipation. Regular exercise in the open air, and some attention to diet made of the girl a changed individual in the course of a few weeks. A dose of castor-oil at the period, administered six hours before the onset of the maximum pain, relieved the dysmenorrhoea.

Six months later the girl married, and some eight months after her marriage she came to consult me as to her sterility. The general health was good, and nothing was complained of save the fear that she was sterile. A thorough bi-manual examination showed the uterus in its former position of retroversion, with the short anterior vaginal wall and shallow

anterior fornix which are found in these primary or 'congenital' cases. In all respects, however, the pelvis was healthy, and I simply advised the patient to wait.

Some time later, by reason of this continued sterility, the patient consulted a specialist in another city. He told her at once that she had a 'backward displacement' of the womb, and that in order to conceive she must undergo an operation to replace this organ. The patient was greatly disturbed by this news, and, on her return to Montreal, demanded immediate operation to correct her deformity. I urged her to wait for another six months before submitting to any such operation, and after deliberation I decided not even to introduce a pessary.

Fortunately for the patient, and for the sake of this argument, two months later she conceived. The uterus was carefully watched during the first few months, and rose in due time, and quite naturally, above the sacral promontory.

The patient was delivered at term in the Montreal Maternity Hospital. The labour was spontaneous, and a second-degree tear of the perineum was immediately repaired. Special care was taken of her during the puerperium. No abdominal binder was applied, she was compelled to nurse her child, and was kept in bed for three weeks. From the very first she was asked to lie in the prone position twice a day for a period of half an hour. She soon found this a position of comfort, and of her own choice lay much in this way. After the third day the genupectoral position was assumed for some ten minutes twice daily. Small doses of ergot and strychnine were exhibited throughout the puerperium, and after the tenth day a hot vaginal douche was daily given.

At the end of the third week the 'discharge examination' showed that the uterus had involuted well, was still retroverted, but remained at a good level in the pelvis. At this time I brought the uterine fundus forward by manipulation, and inserted an Albert Smith pessary. This pessary held the uterus in anteversion, and she wore it for the next three months, when it was removed.

For the ensuing two years the patient remained well, and I did not see her. Last December she came to see me, again pregnant some two months, and with the uterus still retroverted.

The foregoing is a fairly typical instance of a so-called 'backward displacement.' It represents a class of case which is by no means uncommon, and its detailed history includes all that I have to say of its conduct and treatment.

If, however, in these cases of 'backward displacement' the general treatment fails to relieve the symptoms of backache and general pelvic discomfort, and especially if the uterus lie somewhat low in the pelvis, the following procedure is recommended.

Treatment in the Married Woman.—The uterus is simply pushed well up in the pelvis, and if it can easily be done the fundus is brought forward, where it is held, either upward, or upward and forward, by tampons of lambs' wool, coated with vaseline, which are lightly packed in the vagina below. No explanation of this manœuvre is given, the patient being merely asked to report herself in two days. If on her return the backache and weight in the pelvis are relieved, it is fair to

assume that the displacement is their cause, and is to be definitely corrected. Where the uterus is merely lifted up in the pelvis, the proceeding affords additional proof that the essential part of the displacement is a prolapse.

In the correction of this displacement, the choice lies between the employment of a mechanical support, a pessary, or operative procedure.

The Use of Pessaries.—Speaking generally, the use of pessaries is rather to be discouraged. The Albert Smith, the Hodge, or the Thomas is the instrument of choice here, and it is only to be introduced after the uterus has been definitely replaced. Prolapsed and inflamed appendages are an absolute contra-indication to its use, for

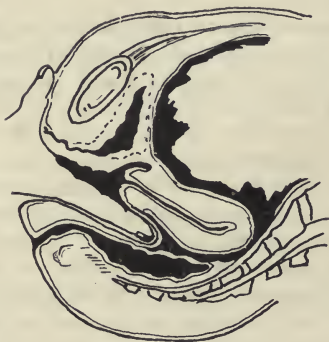


FIG. 313.—To 'replace' the retroverted uterus. The finger in the posterior fornix is beginning to elevate the whole uterus, and to lever its body forward.

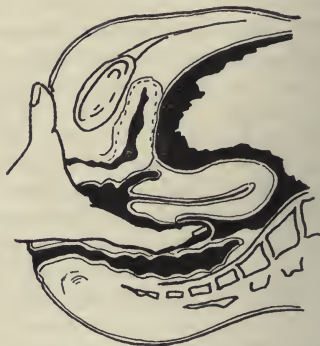


FIG. 314.—To 'replace' the retroverted uterus. The whole uterus is further elevated, and its body is now almost upright.

it is only to be employed when the pelvis is healthy and the uterus mobile. While a pessary is worn, a daily vaginal douche should be taken, and it should be removed and cleansed every three months, and at the same time the vaginal vault carefully examined for the presence of excoriation or pressure-ulcers.

The first procedure is to 'replace' the uterus. In the ordinary case this can be done by means of bi-manual manipulation. With the vaginal fingers, the cervix uteri is pushed backward into the hollow of the sacrum until it comes to underlie the fundus. A finger in the posterior fornix lifts the whole uterus upward, and, presses the body of the uterus forward (Figs. 313 and 314). At the same time, the fingers of the external hand press the abdominal wall deeply into the spine just above the promontory, and so are enabled, in the average subject, to meet the fundus as it emerges from the pelvis, and engage it forward (Figs. 315 and 316). The

adoption by the patient of the Sims' position is often an assistance at the beginning of this manoeuvre, while the introduction of the middle finger into the rectum enables the examiner to exert a stronger forward leverage upon the uterine body. The genupectoral position is not often required, while the use of a volsella to grasp the cervix, and of the uterine sound to lift the body forward, are seldom necessary, and are only to be used under the strictest aseptic precautions. In rare and difficult cases a general anaesthetic may be requisite. Under no circumstances should any

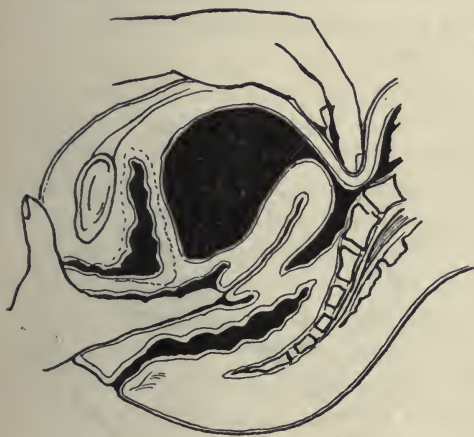


FIG. 315.—To 'replace' the retroverted uterus. The cervix is pushed strongly backward and upward by the internal finger. The fundus is emerging in front of the sacral promontory, and is being met by the external hand.

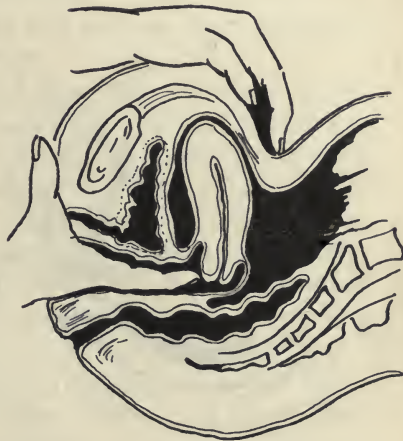


FIG. 316.—To 'replace' the retroverted uterus. The fundus uteri has now been definitely brought forward, and the uterus is in the position of anteversion.

force be exercised, and despite the recommendation of Schultze, no attempt should be made to break down existing adhesions.

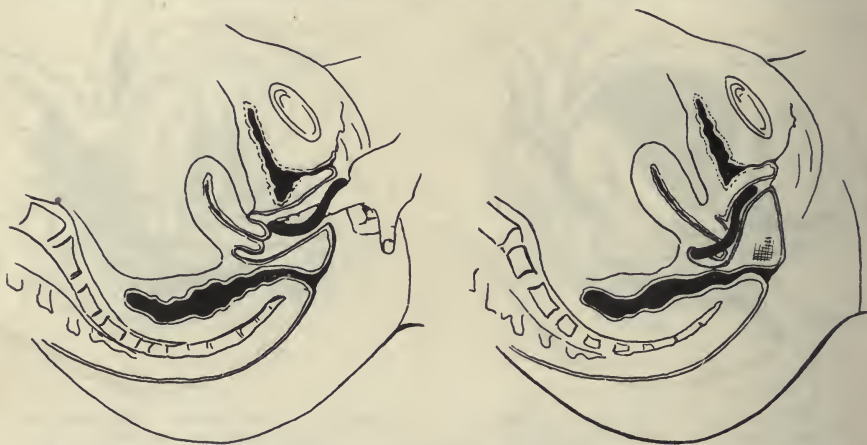
To Introduce the Pessary.—The uterus being definitely replaced, is held in position by the vaginal finger pressing the cervix firmly upward and backward. With the patient in the Sims' position, the pessary, surgically clean and anointed with vaseline, is introduced by the left hand, along the right index finger, which acts as a speculum, pulling the perineum firmly backward. The upper end of the pessary is then carried on by the right index finger up into the posterior fornix, where it is definitely in position (Fig. 317). The pessary should lie in the transverse diameter of the vagina, and its lower end should be well above the urinary meatus. Its point of support below is the soft tissues which narrow the vaginal outlet, while

its upper end carries the posterior fornix and the cervix uteri upward and backward (Fig. 318). It should fit well, and be worn unconsciously by the patient; it is no bar to marital relations, and is in no sense a curative agent.

The following complications require special attention :

1. *Sterility*.—Where sterility threatens to become confirmed, a uterus that is retroverted should be placed in the position of anteversion, and held there, either by a pessary or a round-ligament suspension, as special circumstances may dictate.

2. *Cervical 'Catarrh' and Chronic 'Endometritis.'*—This condition is to be treated here in the same way as if the uterus were forward in position. When both



FIGS. 317 and 318.—The introduction of the pessary. In Fig. 317 the upper end of the pessary is being carried into the posterior fornix. In Fig. 318 the pessary is in position.

the menstrual and intermenstrual discharges are excessive, and the patient suffers both from menorrhagia and leucorrhoea, and these signs persist, there is adequate indication for a curettage. In simple retroversion this curettage alone may be quite sufficient to relieve the condition; if, however, the uterus be at the same time prolapsed, this curetting should be but a preliminary to the support of the uterus by a pessary, or by operation.

3. *Retroversion with Adhesions*.—If in any case a retroversion of the uterus is complicated by adhesions, involving either the uterus itself or its appendages, treatment should first be directed to the relief of the inflammatory lesion. These adhesions are to be recognized by the definite fixation of the uterus and its adnexa, or the detection of exudate, or 'bands' between them. The 'displacement' is so rendered irreducible. Under these circumstances no attempt at 'replacement' of

the uterus should be made. Such a case may be treated by douches, baths, tampons, or by repeated 'cures' at a suitable Spa. Such palliative measures may relieve the patient altogether of symptoms, even though the uterus remains retroverted. Usually, however, operative measures are sooner or later indicated.

Treatment in the Unmarried Woman.—Where general treatment fails, and there is evidence from a rectal examination that the retroverted uterus is prolapsed, a suspension-operation is, in my opinion, justified. In these cases local treatment is to be avoided, and the use of pessaries always discouraged.

Operative Treatment

As we have seen, the cases of uncomplicated retroversion of the uterus which demand remedial measures are those which are accompanied by a degree of prolapse, for it is the prolapse which is the cause of the symptoms. Hence, the operation undertaken to relieve these symptoms must not only hold the body of the uterus forward, but must to some degree suspend it. Accordingly, in 'backward displacements' those operations will be found the most successful which not only place the body of the uterus forward, and so at an advantage in the pelvis both in respect of gravity and intra-abdominal pressure, but which, in addition, provide some definite suspension. In the choice of operation these two considerations must never be lost sight of, for in these cases it is not enough merely to draw the fundus of the uterus forward.

Again, the choice of operation will depend upon whether or not the woman is in the child-bearing period. If there is no question of a possible pregnancy, the best operation is the one which most simply, most efficiently, and with the least likelihood of relapse, holds the uterus upward and forward in the pelvis. Where pregnancy is to be considered, the wisest procedure, in securing such a suspension, selects those structures which share in the growth of the uterus during pregnancy, and in its involution during the puerperium. In this way, not only is a considerable degree of natural mobility permitted to the uterine fundus during pregnancy, but also the recovery of the suspension after labour is to a considerable extent assured. The only structures that fulfil these conditions are the round ligaments. These intimately share the vicissitudes of the uterus during pregnancy and the puerperium; and though they are subject to marked variation, their tensile strength at their uterine end is considerable.

Accordingly, the operation of choice is always a form of uterine suspension: (1) in the child-bearing woman, a round-ligament ventri-suspension; (2) in the non-child-bearing woman, a direct ventri-suspension.

In either case the abdomen should be opened from above, either by a vertical

or a transverse incision. By this route only is easy and complete access to the viscera of the pelvis and lower abdomen secured. Even by the most expert and painstaking diagnostician the exact condition of the pelvis, in respect of utero-intestinal adhesions and minor degrees of tubal disease, is to be definitely learned only when in this way the abdomen is opened. In addition, it is only by the abdominal route that such conditions can be efficiently dealt with. Moreover, this procedure enables one to examine and, if advisable, to remove the vermiform appendix; this is in itself a

matter of no small importance to the young and the middle-aged woman.

Though the vaginal route has been advocated (and notably by Schnecking, Klatz, Goffe, Vineberg, and Worth) it has not been generally accepted, and I do not recommend it.

The Alexander-Adams' operation, or the extraperitoneal shortening of the round ligaments, even with its latest modifications as practised by Martin, Doléris, and Wilcox, not only has a comparatively restricted field of usefulness,

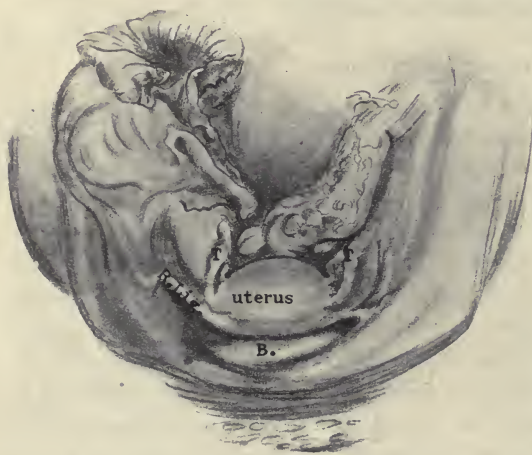


FIG. 319.—View from in front showing the usual position of the uterus. The course of the round ligament is shown, and the lower position of its middle portion. (After Sellheim.)

R. Lig.=Round ligament. T. Fallopian tube. B. bladder.

but is always subject to the following adverse criticism. (a) Even in the most expert hands the bi-manual examination never completely reveals the actual condition in the pelvis, and accordingly this operation is performed somewhat in the dark. Where there is palpable pelvic disease its employment is of course altogether contra-indicated. Goldspohn's recommendation of opening the abdomen through the internal ring to inspect the pelvis is laboured and unsurgical. (b) In not a few cases, one or both of the round ligaments are small, undergrown, and of poor tensile strength. (c) Even when successfully performed, and when the ligaments are strong and well-developed, this operation does not, in an effective way, suspend the uterus. The inguinal traction on the ligaments draws the uterine fundus forward, it is true, but also outward and slightly downward. It is downward, for the reason that the mid-portion of the round ligament is at a lower

level than its uterine end, when the uterus is anteverted, for, as the ligament is withdrawn the portion within the broad ligament is held down as by a pulley. The outward direction of the pull to the internal abdominal ring renders the forward draw oblique, and makes it thereby only a partial expression of the strain (Fig. 319).

Even in selected cases this operation has no special advantage. It can scarcely be said to incur a lesser degree of risk, for, with our modern technique, "two cuts half-way through the abdominal wall are scarcely more or less dangerous than a single cut all the way through."

1. A Round-Ligament Ventri-suspension—an Internal Shortening of the Round Ligaments.—There are three operations that are definitely recommended, the choice between the three being subject to the special conditions of the case. These are : (a) the Gilliam round-ligament ventri-suspension (somewhat modified); (b) the Baldy-Webster, or the 'sling' operation; (c) the Ols-hausen method of attaching the round ligaments to the anterior abdominal wall, as practised by Vineberg and others. This operation is sometimes called a ventri-suspension, but with equal truth it may be classified as a round-ligament suspension.

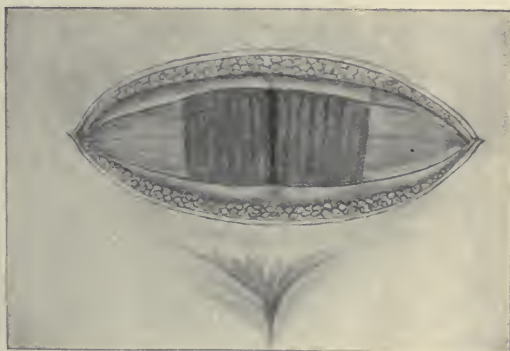


FIG. 320.—The Pfannenstiel incision has been made through the skin, fat, and the fascial sheath overlying the rectus muscles. The underlying rectus muscles are shown.

(a) *The Gilliam Round-Ligament Ventri-suspension.*—This operation of round-ligament ventri-suspension has been variously modified during recent years. Among the most suggestive of these modifications are that of Fergusson, Barrett, Dudley, and the retroperitoneal method of Simpson. I perform the operation in the following way.

The Pfannenstiel incision is made through the skin, fat, and the fascial sheath overlying the rectus muscle (Fig. 320). The cut edges of this fascial sheath are now grasped in the mid-line by Allis forceps, and by blunt dissection they are freed from the underlying rectus muscle, the dissection being prosecuted in the vertical direction as far as the transverse incision through the fascia will permit. Traction-sutures now draw this fascia upward and downward in the mid-line. The abdomen is

entered by a vertical incision through the right rectus muscle in the plane of its inner and middle third, and the opening in the peritoneum is made as nearly as possible in the middle line.

The pelvic viscera are now carefully examined, special attention being paid to the condition of the Fallopian tubes. If lesions exist they are dealt with. The round ligaments are inspected in respect of their uniformity, size, and strength; the normal course of the deep epigastric artery is always verified.

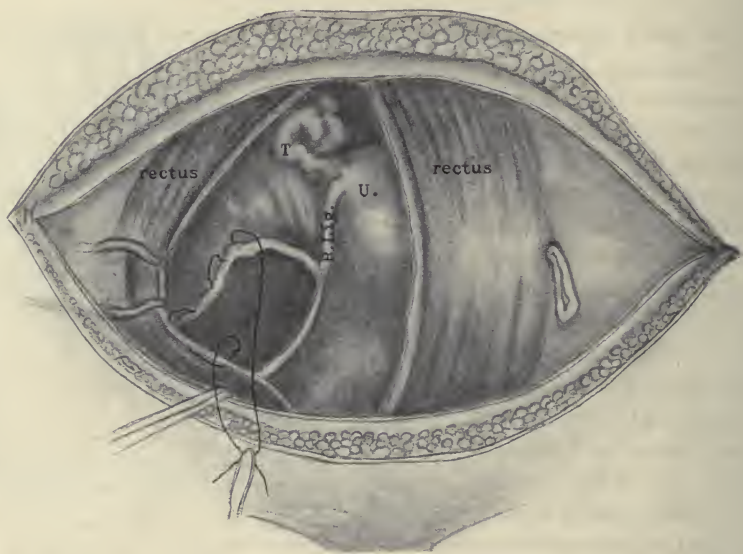


FIG. 321.—The running suture between the round ligament and the parietal peritoneum has been passed, but is not tied. The puncturing forceps has been introduced to the outer side of the right rectus muscle, and the round ligament is seen within its grasp. On the left side is shown the loop of the round ligament which has been withdrawn.

The caecum is now drawn into view, and the condition of the vermiform appendix and any ilio-colic angulations by bands or adhesions, is carefully noted. In women under forty the vermiform appendix is always removed; after that age it is not disturbed if it is healthy.

Now the round ligament of one side is caught up with Allis forceps, about an inch and a half from the uterine cornu. The distal portion of the round ligament, beginning at the internal inguinal ring, is next stitched from without inward, to the peritoneum of the anterior parietal wall. A running suture is employed, and four or five stitches are sufficient; the last stitch includes usually the plica hypogastrica,

and the round ligament, half an inch external to the grasp of the Allis forceps. The rectus muscle of this side is now drawn inward, and at its outer edge, a pair of sharp-curved forceps is made to perforate directly the fascia and peritoneum. This entrance into the peritoneal cavity is so made in the 'middle inguinal fossa,' and at some distance from the deep epigastric vessels. This forceps now supplants the grasp of the Allis forceps on the round ligament, and the ligament itself is so withdrawn

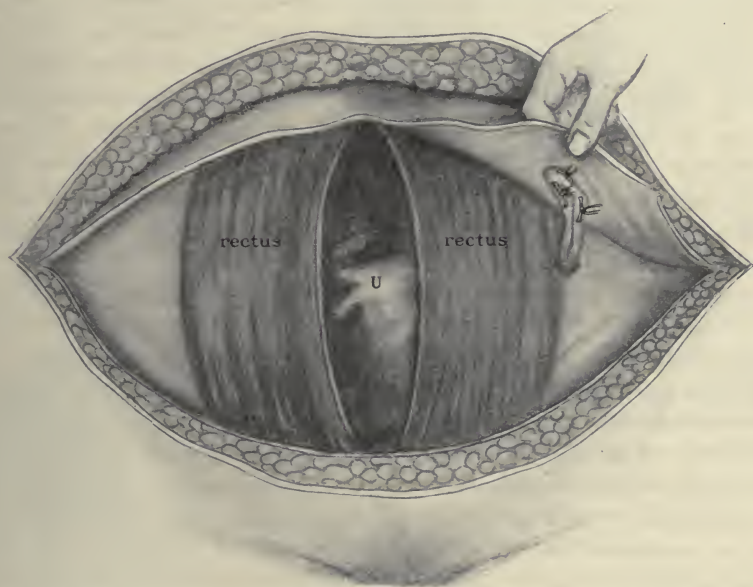


FIG. 322.—The loop of round ligament on the left side is shown withdrawn, and stitched to the under surface of the rectus fascia. Three sutures have been employed, and have been passed through the ligament in a longitudinal direction.

outward upon the rectus muscle (Fig. 321). Special traction is made upon its uterine end until the uterine cornu is brought well forward, and special care is taken to see that the Fallopian tube is not drawn into the opening, or even unduly kinked, and that the fundus uteri will have ample room to swing clear of the abdominal wall.

A similar procedure is now employed on the opposite side.

The loops of the round ligament, which have been so withdrawn, are now stitched to the under surface of the rectus fascia. These sutures are placed in the round ligament in a longitudinal direction, and are three or four in number (Fig. 322). The abdominal wound is now closed.

This operation, as so performed, exhibits the following advantages: (1) the strongest part of the round ligament is used, and of this only a very short part; (2) the pull of the transplanted ligament upon the fundus uteri is almost directly upward and forward, so that the maximum sustaining power of the ligament is secured; (3) no opening is left to the outer side of the new insertion of the ligament, 'the pillar,' past which a hernia of bowel might occur; (4) the risk of wounding the deep epigastric veins with the formation of a parietal haematoma is avoided.

(b) *The Baldy-Webster, or 'Sling' Operation.*—This operation is deservedly popular, and has many enthusiastic adherents. It is of special use where the round ligaments are strong and equally developed; in patients whose abdominal wall is fat; and where there is a healthy uterus and appendages with only a slight degree of descent in the backward displacement. It is performed in the following way.

The abdomen is opened by a mesial vertical incision. The fundus uteri is brought forward into view, and grasped with elevating forceps (Barrett's), which inflict no injury. The uterus is held well forward, and a pair of long forceps is driven, from behind forward, through the 'clear' space immediately beneath the utero-ovarian ligament. These forceps emerge in front just above the round ligament, which they are made to grasp about an inch and a half from the uterine cornu. The round ligament is pulled back through the broad ligament, and attached by suture to the scarified posterior wall of the uterus, in the neighbourhood of the attachment of the utero-ovarian ligament. The same procedure is performed on the opposite side, and the uterus is so slung between the round ligaments.

The points of disadvantage are: (1) the weakest part of the round ligament bears the suspension strain, and the direction of the pull remains oblique; (2) the trauma incurred may involve in adhesions the neighbouring ovary and tube.

(c) *The Olshausen Method of attaching the Round Ligament to the Anterior Abdominal Wall.*—This operation approaches a ventri-suspension; it is the strongest modification of a round-ligament ventri-suspension. It is best employed where there has been the separation of many adhesions to liberate the viscera, where the prolapse is considerable, and the demand for the suspension accordingly great. When rightly performed the fundus uteri retains to a considerable degree its mobility, and a subsequent pregnancy may be safely experienced.

The following are the details of the operation. The abdomen is opened by a vertical mesial incision, and, after the routine inspection and treatment of any concurrent lesion, the suspension is undertaken. The rectus fascia is exposed to the distance of an inch on either side of the incision. A chromic gut suture, No. 2, is then passed with a Martin's full-curved needle, directly through the fascia, rectus

muscle, and peritoneum, at about an inch from the edge of the incision. This needle now picks up the round ligament in a horizontal bite, a half inch from the uterine cornu; and is next passed from within outward through the peritoneum, muscle, and fascia, to emerge a short distance from its entrance. A second suture is passed slightly nearer the middle line, which picks up the round ligament close to the uterine cornu. These sutures are held while the opposite side is treated in similar fashion. All the sutures are now tied, not tightly, and they so suspend the uterus directly to the abdominal wall by means of its round ligament (Figs. 323 and 324). It is wise in closing the peritoneum with the ordinary

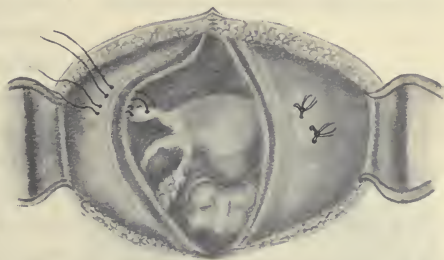


FIG. 323.—A round ligament ventri-suspension (Olshausen). On the left side the two sutures have been passed, and are in position. On the right side the sutures have been tied.

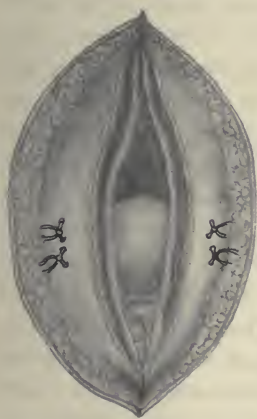


FIG. 324.—The completion of the round-ligament ventri-suspension (Olshausen). The sutures on both sides have been tied. The fundus uteri is distinctly seen through the incision.

continuous suture to pass one stitch lightly through the perimetrium of the fundus, and so to obliterate the central small opening between the attached ligaments. By so doing, the risk of a bowel-incarceration is avoided.

The Richelot-Dol  ris operation of round-ligament suspension, and the *ligamento-pexie abdominale* of Beck, are further modifications of this same principle, but in my hands their results are not so satisfactory.

2. A Direct Ventri-suspension.—This definite attachment of the uterine body to the anterior abdominal wall we owe in America to Howard Kelly.

The operation is preferably performed on the non-child-bearing woman, though so long as a ventri-suspension only is the result of the operation, no special danger from a pregnancy may result. My older records show 11 cases of ventri-suspension, followed by a subsequent pregnancy, where delivery was in no way complicated. But in the same period of time, 3 cases of severe dystocia, one case demanding Caesarean section, came into my service as a result of an accidental ventri-fixation. In these 3 cases, a ventro-suspension had been done, but an infection in the incision had resulted in a ventri-fixation.

It is quite true that, with modern technique, a wound-infection is comparatively rare. But the danger of the suspension becoming thereby a fixation is always to be remembered, and it is one of the contra-indications to the performance of this operation during the child-bearing period. A second and chief objection lies in the fact that

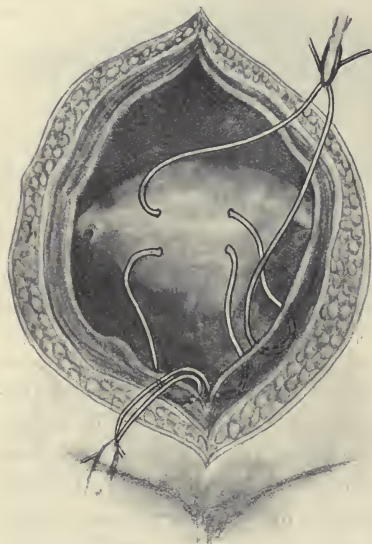


FIG. 325.—A direct ventri-suspension. The lower of the two sutures is passed completely; the upper suture is passed only on the left side. A portion of the rectus muscle is included in the bite of the suture.

the adventitious band between uterine fundus and abdominal wall, never to any appreciable extent recovers after the pregnancy; it remains long and attenuated, and so permits a recurrence of the condition for which the operation was undertaken.

The operation as I perform it in the non-child-bearing woman is as follows; so executed it really partakes of the nature of a ventri-fixation, for I include a portion of the rectus muscle within the sutures.

The abdomen is opened in the middle line, and the requisite surgery of the pelvis and lower abdomen is undertaken. Then the fundus uteri is brought forward, and two sutures of chromic gut, No. 2, are employed. These sutures are passed through the peritoneum, in the way advised by Kelly, and are made to include in their transit a definite portion of the rectus muscle; they are passed deeply into the anterior wall of the uterus, one at the level of the fundus, and one some half inch below (Fig. 325). When tied a broad portion of the perimetrium and parietal peritoneum are approximated. In closing the abdominal incision, one continuous suture closes the peritoneum and muscle; while a second continuous suture approximates the rectus fascia above them. In this way the rectus fascia is not definitely attached to the uterus, and hence the operation is not, strictly speaking, a ventri-fixation. The muscle and peritoneum, however, give to the uterus an attachment which, in my experience, is sufficiently strong.

This operation as so performed is seldom complicated by a haematoma, the risk of wound-infection is reduced to a minimum, and its results are extremely satisfactory.

PROLAPSE

By W. E. FOTHERGILL, M.D.
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CLINICAL TYPES OF PROLAPSE

THE word *procidentia* brings to mind the vision of an inverted vagina hanging outside the vulva and containing the uterus and appendages, a considerable portion of the bladder, and, often, some small intestine. The term *prolapsus uteri* suggests organs in one or another of the stages that lead to the complete downward displacement known as *procidentia*. But what of the word 'prolapse'? It is constantly used as a name for conditions which are not stages or phases in the development of the classical *prolapsus uteri*. It is, in fact, an elastic clinical term corresponding more or less with the popular expression 'falling of the womb.' Patients with cystocele or rectocele say they have 'falling of the womb'; and medical men say these patients have 'prolapse,' although the uterus is in perfect position.

It is necessary, therefore, to analyse the group of conditions to which the name is loosely applied, and to define the more important varieties of 'prolapse.' These varieties occur separately and also combined with one another. Combinations and complications render the task of analysis more difficult than it would be without them. Still certain dislocations of the pelvic organs can be recognized as types of prolapse.

Type I. Cystocele.—The patient is, with rare exceptions, a parous woman. The vaginal orifice has been enlarged by tearing or by stretching, and part of the anterior vaginal wall is exposed. When the patient strains or coughs, the anterior vaginal wall, with the urethra and more or less of the bladder, bulges at the vaginal outlet forming a swelling 'like an egg.' The relation of the bladder to the swelling may be demonstrated by passing a sound up the urethra. On bi-manual

examination, the cervix points downwards and backwards; the body of the uterus is felt through the anterior fornix, in front of the cervix, anteverted. The patient being told to bear down while the fingers are still in the vagina, the uterus is felt to remain anteverted while the anterior vaginal wall is partially everted from below upwards, carrying with it the urethra and bladder.

Mere exposure of the lower part of the anterior vaginal wall by tearing of the



FIG. 326.—Cystocele. The uterus remains in the normal position of anteversion.

perineum must be carefully distinguished from real cystocele, as the appropriate treatment is quite different.

Type II. Classical Prolapse. Prolapsus Uteri.—*Stage I.*—In all but the rarest instances the patient is a parous woman. The vaginal outlet is enlarged by stretching or by tearing. When the patient strains, the anterior vaginal wall, with the urethra and part of the bladder, bulges at the vulva as in cystocele. The patient being asked to cough or strain when the fingers are in the vagina, the uterus is felt to move downwards with its long axis in the axis of the pelvis or behind it. Thus, when the patient strains, there is not only cystocele, but also retroversion, and the body of the uterus is felt through the posterior vaginal fornix. As the

cervix descends it pulls down with it the upper part of the posterior vaginal wall, which is thus inverted from above downwards while the anterior vaginal wall is everted from below upwards.

Stage II.—Inspection shows the anterior vaginal wall completely everted,



FIG. 327.—Prolapsus uteri.

the os uteri being at or near the vaginal outlet. Thus there is no anterior fornix left. The posterior fornix remains, but is shortened by half as the posterior vaginal wall is inverted from above downwards, and its junction with the cervix is on the anterior margin of the perineum.

Stage III.—Complete *prolapsus uteri*, known also as *procidentia*. The vagina

is completely turned inside out, and hangs outside the vulva. Within it lie the uterus and appendages, the urethra, a portion of the bladder, and, often, some small intestine. The rectum occupies its normal position, the posterior vaginal wall being separated from the anterior rectal wall by the intrusion of the pouch of Douglas.

In a case of this kind the development of the condition can be recapitulated and its mechanism demonstrated. The parts having been restored to their proper



FIG. 328.—Prolapsus uteri with ulceration of cervix.

position within the pelvis, the patient is asked to bear down. (Stage I.) the anterior vaginal wall is first seen being gradually everted from below upwards. (Stage II.) the cervix next appears at the vaginal outlet. (Stage III.) lastly, the inversion of the posterior vaginal wall from above downwards is seen to proceed until, when the posterior fornix disappears, the inversion is complete.

In classical prolapse the uterus may be large or small; the cervix may be long or short, whole or split; the perineum may be torn or may be merely stretched. The condition may or may not be complicated by rectocele. But the salient

features remain—the early signs are cystocele and retroversion; and, as the displacement proceeds, the anterior vaginal wall everts from below upwards while the posterior vaginal wall inverts from above downwards.

Type III. Inversion of the Vagina from above downwards (Hypertrophy of the Supravaginal Cervix).—The patient is generally a parous woman, but is often a nullipara. In fact, cases of ‘prolapse in virgins’ are generally of this variety, and are not either cystocele or classical prolapse. Out of 187 cases of prolapse the 10 which occurred in nulliparae were all of this variety. The vaginal outlet is often stretched by the descending cervix in nulliparae, and it may be both stretched and torn in parous women. The finger meets the cervix, pointing downwards and forwards, near the vaginal orifice; or the cervix may appear at the vulva when the patient strains. There is no cystocele, as the anterior vaginal wall is not everted from below upwards. The anterior fornix remains. But both anterior and posterior fornices are shortened, because both anterior and posterior vaginal walls are inverted from above downwards and invest the descending cervix. The rectum remains in its normal position. The uterus is long, and this is mainly due to elongation of its cervical portion.

The uterus is also retroverted, its fundus occupying a position more or less behind the pelvic axis. In parous women the cervix is generally split, in nulliparae it is simply long.

Strictly, the condition should be called hypertrophy of the cervix; but it is



FIG. 329.—Hypertrophied cervix, with inversion of vagina from above downwards, in nullipara. No cystocele.

constantly diagnosed as 'prolapse.' It is, in fact, a displacement which occurs when a uterus is both long and loose. The displacement is more evident clinically than the hypertrophy which is the primary feature of the case, but which is often definitely recognized only when the uterus is measured with a sound. This con-



FIG. 330.—Hypertrophied and split cervix with inversion of vagina in a parous woman. No cystocele.

dition sometimes progresses until both vaginal walls are completely inverted, and it then superficially resembles complete classical prolapse or *procidentia*. But if the organs are replaced in the pelvis, and the patient is told to bear down, it is the cervix which emerges first at the vulva, and not the anterior vaginal wall. On

the other hand, in cases of classical prolapse, the anterior vaginal wall always emerges first and is followed by the cervix.

Type IV. Rectocele.—The patient is always a parous woman, and the perineum has always been torn. When the patient strains, the posterior vaginal



FIG. 331.—Rectocele. Uterus and anterior vaginal wall remain in normal position.

wall bulges at the vaginal outlet and forms a swelling 'like an egg.' This swelling is lined by the anterior rectal wall which is adherent to the posterior vaginal wall. Thus the swelling contains a pouch of the rectum, as may be demonstrated by passing a finger into it through the anal canal. When the perineum

is torn completely, the patient does not strain at stool and rectocele does not follow.

Rectocele may occur alone, with cystocele, with classical prolapse, or with inversion of the vagina from above downwards. In the two latter cases, the lower part of the posterior vaginal wall is everted from below upwards, while, at the same time, its upper part is inverted from above downwards.

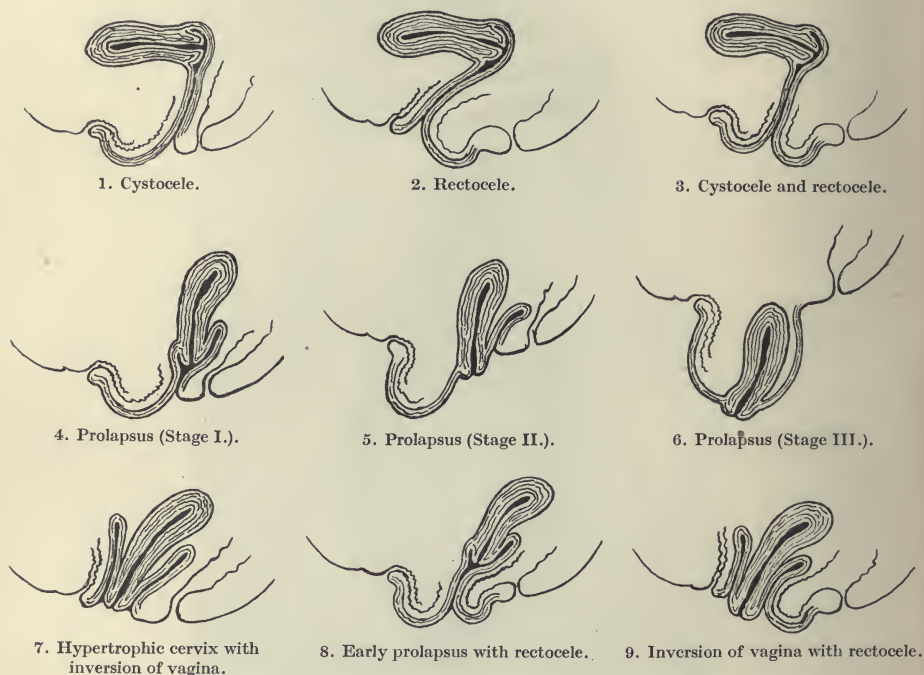


FIG. 332.—Diagram of varieties of prolapse and combinations.

It will be recognized that rectocele is not quite comparable with the other forms of prolapse. As Berry Hart has said, it is a distension, while prolapse is a hernia. It has a special pathology and causation (see p. 640).

Definition.—If it is granted that the types now described with their various combinations include the majority of cases known as prolapse, an attempt may be made to form a definite idea of what is meant by the term prolapse. We must first consider the meaning commonly attached to the term ‘pelvic floor.’ Berry Hart regards the pelvic floor as the whole of the structures which occlude the out-

let of the bony pelvis, from the peritoneum within to the skin without. Though anatomists use the term 'pelvic floor' in a more restricted sense, Hart's use of it is sanctioned by time and by its utility in considering displacements.

The uterus and its appendages, the bladder, urethra, and vagina, with the connective tissue that binds them together, form what Hart termed the "entire displaceable" segment of the pelvic floor. The "entire fixed" segment includes the pelvic diaphragm (Meyer), the muscles of the sphincter layer, fascia, fat, skin—in fact, the whole of the structures which line the pelvis and occlude its outlet. "This is a terminology," says Hart,¹ "highly useful, as it puts the matter of so-called *prolapsus uteri* thus: *Prolapsus uteri* is a displacement of the entire displaceable portion past the entire fixed portion of the pelvic floor." This definition will include other varieties of prolapse as well as *prolapsus uteri* if it is read: "*Prolapse is a displacement, in part or in whole, of the displaceable portion of the pelvic floor past the entire fixed portion.*" The main idea in prolapse is a dislocation between the pelvic viscera and the pelvic somatic structures, and this dislocation occurs in the position of the subperitoneal tissue which intervenes between the mobile and the fixed portions of the pelvic floor.

ANATOMY

During recent years knowledge of the pelvic floor has advanced greatly. Peter Thompson² published his classical description of its musculature in 1899, and there has been a complete revolution in the teaching of what used to be called the 'pelvic fascia.' This is now simply described as the fascial coverings of the pelvic muscles, and not as a series of independent structures. Much attention has also been paid to the subperitoneal tissue which intervenes between the pelvic viscera and the more fixed portion of the pelvic floor. It has been realized that this tissue contains no real ligaments. 'Broad ligament' is, of course, a mere name. The 'round ligament' is muscular, as is the 'ovarian ligament.' The 'utero-sacral' and 'utero-vesical ligaments' are composed of smooth muscle and fibrous tissue continuous with that of the uterus, and are not definite structures.

It is perhaps necessary to add that it was supposed formerly that the uterus was more or less suspended from above by the round and broad ligaments. When abdominal sections became common, it was seen that, with the corpus uteri, these so-called ligaments lie loose upon the upper surface of the pelvic floor. At the present day no one would seriously maintain that they play any appreciable part

¹ *Edinburgh Medical Journal*, 1899.

² *Myology of the Pelvic Floor*, 1899.

in resisting intra-abdominal pressure, or indeed in determining the position of the pelvic viscera.

It was formerly thought that a complete ring of loose cellular tissue surrounded the mobile portion of the pelvic floor,¹ but, at the sides of the viscera, there is much fibro-muscular tissue. Thus Kochs² realized that the parametria make the cervix the most fixed portion of the uterus, the corpus being free to move between anteversion and retroversion about a transverse axis passing through the cervix. He unfortunately gave the misleading name *ligamenta cardinalia*

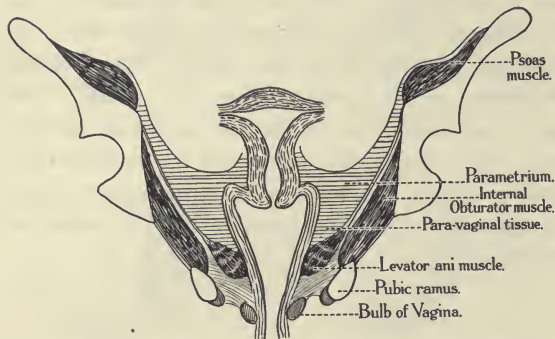


FIG. 333.—Diagram to show the subperitoneal fibro-muscular tissue (marked parametrium and para-vaginal tissue) intervening between the movable and the fixed portions of the pelvic floor.

to the strong fibro-muscular tissue continuous with the cervix on either side,

Savage³ wrote that after division of the utero-sacral ligaments, obstruction to prolapse is offered by the subperitoneal cellular tissue, particularly where it surrounds and accompanies the uterine blood-vessels, and "the utero-iliac cellular process accompanies the uterine

vessels, forming a resisting fibro-cellular bond between the uterus and the sacro-iliac articulation."

Clarence Webster⁴ stated that the chief attachment of the uterus was the "connective tissue attaching the cervix to the side walls of the pelvis and also the muscular and elastic tissue in the same position."

Mackenrodt⁵ described his *ligamentum colli transversum* some time later. He, like Kochs, saw that the main attachment of the uterus was the tissue in question, and he also was wrong in describing it as a definite ligament.

Describing the two main lateral masses of subperitoneal tissue Cameron writes:⁶

¹ Hart and Barbour, *Manual of Gynaecology*, 4th ed., 1890.

² *Die normale u. path. Lage und Gestalt des Uterus*, 1880.

³ *The Surgical Anatomy of the Female Pelvic Organs*, 1882.

⁴ *On Researches in Female Pelvic Anatomy*, 1892.

⁵ "Über die Ursache der normalen u. path. Lagen des Uterus," *Arch. f. Gyn.*, 1895, xlviii.

⁶ *Journ. Anat. and Phys.*, Oct. 1907.

"It is most convenient to devote attention first of all to the internal iliac vessels. The anterior divisions along with their visceral branches are found to be bound together by a dense connective tissue—the perivascular sheaths. The resultant compact mass will be found to lie more or less in a vertical plane, and to possess fairly definite borders of attachment. Thus it was previously shown to be firmly united by its external border and antero-external surface to the innominate bone close to the sciatic notch, and, lower down, to the obturator fascia. From this origin the mass passes forwards and inwards along with the vessels to blend internally with the posterior part of the lateral aspect and base of the bladder, the seminal vesicles, and the lower part of the rectum. The upper margin is free, and contains the anterior division of the internal iliac artery with its continuation the obliterated hypogastric. Note particularly that the ureter is bound down by fibrous tissue, first to the upper border, and then as it approaches the bladder, to the posterior aspect of this mass. The lower margin is intimately blended with the sheath on the pelvic surface of the levator ani. It may now be recognized that we have here a sort of fascial mesentery which must constitute an effective support to the pelvic viscera. The fascia tends to become denser and stronger as it is traced downwards towards the pelvic floor. The latter part corresponds to the suspensory ligament of the genito-urinary organs recently described by Paterson. In the female the relative development of the connective tissue round the visceral branches of the internal iliac vessels is just as pronounced as in the male. The perivascular fascia is closely attached to the vaginal and uterine walls by the dense sheaths surrounding the vessels passing to these structures."

Paterson¹ describes the subperitoneal tissue as sweeping round the sides of the pelvis, leaving a large free space behind, in which the rectum lies free to move, attached only in the rear. The front of the pelvic cavity, however, is filled up by the tissue in question except where it is penetrated by the lower portions of the uterus and bladder, and by the vagina and urethra. Paterson, unfortunately, named the lower portion of the subperitoneal tissue "the suspensory ligament of the genito-urinary organs."

Derry says: ² "The viscera are simply invested by the remains of the tissue in which they were originally developed, and the same applies to the vessels which supply them. This tissue is condensed in places to form definite ensheathing layers, particularly in the neighbourhood of the vagina and lower part of the uterus in the female. But any attempt to give definiteness to such layers is not only artificial, but makes the description unnecessarily complicated and confusing; for the simple reason that these layers, though well marked in the regions named and also round the rectum, pass gradually into the general mass of subperitoneal tissue which fills the pelvic cavity and are no longer traceable."

Moritz³ has published sections to show the presence of abundant smooth

¹ *Journ. of Anat. and Phys.* xli., 1907.

² *Journ. of Anat. and Phys.*, Oct. 1907.

³ *Journ. Obstet. and Gyn. of British Empire*, March 1913.

muscle and the absence of any structures of a ligamentous nature in the positions of those described by Koehs, Mackenrodt, and others.

References¹ to other work on this subject and to a restatement of it by the present writer are given below.

The main results of recent observation may be summarized as follows. The subperitoneal tissue which intervenes between the pelvic viscera and the fixed structures contains quantities of smooth muscle as well as fibrous tissue. These elements are grouped so as to form sheaths for the vessels, lymphatics, and nerves. Thus the tissue in which the lower portions of the pelvic viscera are embedded has muscular tone, and is indeed actively contractile. It can vary in bulk from time to time according to the amount of fluid in its vessels, and can adjust itself to variations in intra-abdominal pressure, and to alterations in the size and position of the uterus, bladder, and rectum.

An instructive dissection can be made at any autopsy on a suitable female subject. Remove the skin, fat, and fascia from the perineal region. Cut away the muscles of the sphincter layer and empty the ischio-rectal fossae, so as to expose completely the under surface of the pelvic diaphragm, namely, the fascia covering the under surface of the levatores ani (pubo-coccygeus and ilio-coccygeus) and coccygei (ischio-coccygeus) muscles. Next open the abdomen and note that the broad and round ligaments lie loose and do not support the uterus.² Remove the rectum completely, together with the anal canal. Cut through the round ligaments. Cut away each ovary and tube together with its mesovarium and mesosalpinx. In other words, cut away each broad ligament, namely the thin fold of peritoneum containing the tube, and having the ovary attached to its posterior surface. The broad ligament does not include the parametrium (Virchow), which is the mass of tissue on either side of the cervix between the pelvic peritoneum above and the vaginal vault below. When this dissection has been made, the uterus remains in its original position of anteversion and at its original level in the pelvic cavity.

Next cut between the levatores ani in the middle line through the perineum and back as far as the tip of the coccyx. The mobility of the uterus, vagina, and bladder is not increased by thus completing the slit separating the lateral halves of the pelvic diaphragm.

¹ Fothergill, *Proceedings Royal Society of Medicine*, Dec. 1907; Elliot-Smith, *Journ. Anat. and Phys.*, April and June 1908; Delbet, in *Traité d'anatomie humaine* (Poirier et Charpy), tome v. fas. i. 2nd ed.; Rieffel, *ibid.*

² The supports of the uterus have also been described in the preceding Article on Backward Displacements; in essential points the two accounts will be found to be in general agreement.—EDITORS.

Next cut transversely for an inch or more into the margin of one or both of the levatores ani, and note that the position and attachments of the uterus remain unchanged. This is done in the living subject every time paravaginal section is performed.

To loose the uterus it is necessary to cut through the parametric tissue continuous with the cervix on either side. To loose the bladder it is necessary to cut through the paravesical tissue which lies between the sides of the bladder and the pelvic diaphragm. To loose the vagina it is necessary to cut through the paravaginal tissue which lies between the sides of the vagina and the pelvic diaphragm. The organs are, in fact, attached where they receive their main blood-supply, namely on both sides of the cervix, vagina, and bladder.

PATHOLOGY

There are but few published records of the lesions found in the pelvis at autopsies on subjects of prolapse. Atrophy of the parametria is the most constant change. The musculature of the pelvic floor is often normal, it may have been injured by tears, and it may share in atrophic changes affecting the pelvic structures. In nulliparae the vaginal outlet is stretched by the prolapsed organs. The pouch of Douglas is extended downwards, and separates the anterior rectal from the posterior vaginal wall except in cases of rectocele. The uterine appendages are in the inverted vagina, and lie outside the vulva in many instances. The vaginal walls are sometimes much thickened by oedema, congestion, and fibrous overgrowth.

In a specimen described by G. F. Barbour Simpson¹ the bladder was entirely outside the vulva. One ovary was in the inverted vagina, the other being retained by adhesions within the pelvis.

Moritz² examined the body of a female aged 55, who had hypertrophy of the cervix with inversion of the vagina from above. The uterus was 3 inches longer than normal and two-thirds of it projected from the vulva, which was stretched by the uterus. The anterior and posterior fourchettes were not torn. The perineum and pelvic musculature were normal. There was no cystocele, and the bladder was within the pelvis. The pouch of Douglas reached the perineal body. The parametric tissues were drawn out into two long lateral ribbon-like folds. The vessels had no tortuosity, and the absence of smooth muscle was very striking. Microscopical examination showed an extraordinary absence of smooth muscle

¹ *Scottish Medical and Surgical Journal*, March 1905.

² Thesis for M.D., University of Manchester, 1914.

in the small quantity of subperitoneal tissue which remained, which, however, contained fat.

Moritz also microscopically examined portions of parametric tissue taken from 22 prolapse-cases at the time of operation. In 15 cases smooth muscle was almost absent, being replaced by a little fat and fibrous tissue. In all cases the muscle-tissue was sparse, stained badly, and was separated by large spaces containing fat. The appearance was in striking contrast to that of sections of parametrium from normal pelvis which show a definite sheet of smooth muscle.

It is now possible to define the lesions which occasion prolapse. These are atrophy and degeneration of the fibrous and muscular elements in the lateral masses of subperitoneal tissue. If the lower part of the paravesical and paravaginal tissue is alone affected, cystocele alone is the result. If the parametric tissue is affected together with the upper part of the paravaginal tissue, and especially if the uterus is elongated by hypertrophy of the cervix, inversion of the vagina occurs from above downwards. If the whole of the lateral fibro-muscular tissue is relaxed, the result is classical prolapse. Relaxation of the parametric tissues alone permits retroversion and nothing else.

Rectocele has a special and definite pathology. The perineum is torn, and the tear becomes infected. The result of the infection is cellulitis in the recto-vaginal septum. The inflammatory process passes away, but leaves the anterior rectal wall united to the posterior vaginal wall by fibrous scar-tissue instead of by loose areolar tissue. In fact, the walls of the two viscera adhere closely instead of slipping freely over one another. The torn surfaces heal by granulation leaving the perineum defective. Subsequently, when the patient strains at stool the rectal wall is prevented, by its adhesion to the vaginal wall, from sliding upward over the faecal mass. It is driven forward with the vaginal wall so as to bulge at the vaginal outlet. Rectocele does not follow tears through the perineum which divide the anal sphincter, for when the sphincter is torn through the patient does not strain at stool. Patients who already have rectocele occasionally suffer subsequently from tears which involve the sphincter.

ETIOLOGY

Classical opinion as to the cause of prolapse was well expressed in Allbutt and Playfair's *System of Gynaecology* (1896), p. 397, by A. R. Simpson, who writes :

"We have seen that the uterus maintains its normal level by virtue of a balance between the structures that sustain it and the forces that tend to depress it. We must look, there-

fore, for the causes of its permanent descent either, on the one hand, to conditions that weaken its supports, or, on the other, to conditions that increase the strain upon them. These conditions are (a) Passive, and (b) Active. Frequently enough these conditions are simultaneously operative in both directions."

Under the heading (a) Passive Causes, Simpson describes—

- i. Faults in the perineum.
- ii. Faults in the vaginal walls.
- iii. Faults in the uterine ligaments.
- iv. Faults in the cellular tissues.
- v. Faults in the pelvis.

Under the heading (b) Active Causes, there are included—

- i. Enlargements of the uterus.
- ii. Distension of neighbouring organs.
- iii. Increase of suprapelvic pressure.

The 'uterine ligaments' and the 'cellular tissues' are alike portions of the pelvic subperitoneal tissue. Thus (a) iii. and (a) iv. may be taken together as equivalent to faults in the structures which intervene between the mobile and the fixed portions of the pelvic floor. The other six conditions mentioned are often present in conjunction with prolapse, but not always. They are also often present in cases in which there is no prolapse. It may be urged that the vaginal outlet and perineum are always defective in cases of prolapse. But they are often stretched by the descending cervix, as in cases of inversion of the vagina from above downwards in virgins and nulliparae. Thus the perineal defect is often a sequel or result, and not a precursor of prolapse. Thus of the conditions enumerated *there is only one lesion, faults in the pelvic subperitoneal tissue (a) iii. and iv.), which is constantly present.* Therefore, this must be the essential lesion. The others are separable accidents favourable to prolapse and nothing more. This conclusion might have been deduced from purely clinical data; but it was not generally realized until it had been demonstrated by anatomists that the fibro-muscular subperitoneal tissue forms an adequate attachment between the mobile and the fixed portions of the pelvic floor.

- It will be granted by all, that this tissue is relaxed in every case of prolapse, that is, in every case in which the mobile portion of the pelvic floor is more or less dislocated from the entire fixed portion. When the organs are once loose, ordinary intra-abdominal pressure is quite sufficient to drive them down. The etiological

problem concerns the causes of the relaxation. What loosens the uterus, the vagina, the bladder, and the urethra ?

According to the classical view, as expressed by Simpson, Hart, and many others, it is a loss of balance between the intra-abdominal pressure and the resistance provided by the pelvic structures. If the intra-abdominal pressure predominates, it is supposed to push the viscera down the sloping upper surface of the pelvic diaphragm, loosening them and displacing them at the same time. There are many who are still satisfied with this etiological working hypothesis.

But there are innumerable women who have both high pressure above and weakened resistance below. They have had many pregnancies, and have worked hard, some have abdominal tumours, and some bad coughs. The same women often have torn perineums and stretched pelvic diaphragms. Yet only a few of these women have prolapse, though the supposed cause is present in all.

Again, there are numerous subjects of prolapse who have no primary defect in the pelvic musculature, and no cause for raised intra-abdominal pressure. In fact, we see loss of balance without prolapse and prolapse without loss of balance. Thus predominance of pressure over resistance cannot be the cause which loosens the attachment between the mobile and the fixed portions of the pelvic floor. Further, the result of this loss of balance between force and resistance is well known. It is descent of the whole pelvic floor without any dislocation of its component parts. The condition has been investigated, measurements have been recorded, and it has been named 'General Descent of the Pelvic Floor' ¹ (see p. 651).

Thus it still remains to be shown what brings about the loosening of the attachment between the mobile and the fixed portions of the pelvic floor, which is the constant and primary lesion present in cases of prolapse. This cannot be done at present, though the lesion is doubtless trophic. In some cases the lesion is congenital, as, for example, when prolapse is seen in conjunction with split pelvis. In cases of spina bifida also, both prolapse and general descent of the pelvic floor are observed. In such cases of developmental error the more ordinary causes of prolapse do not pertain, but a valuable hint as to their trophic nature may be gained. For in spina bifida the nerve-supply is probably altered so that either the pelvic floor as a whole is badly developed, or the subperitoneal pelvic tissue is poor in the muscular and fibrous elements that attach its mobile portion to its fixed portion.

The vast majority of subjects of prolapse are parous women ; but the vast majority of parous women do not suffer from prolapse. Therefore normal pregnancy and parturition cannot be said to loosen the pelvic viscera. It must be

¹ Skene, *N.Y. Med. Journ.*, 1885, vol. xli.

something abnormal in the reproductive process which does so. This abnormality is probably an excessive involution of the smooth muscle of the reproductive organs and of the sheaths of their blood-vessels, nerves, and lymphatics. The uterine muscle is not, as a rule, completely restored even after ordinary involution. After each pregnancy there is less muscle and more fibrous tissue in the uterus and in the subperitoneal structures than there was before it. Superinvolution more definitely reduces the muscular tone of the uterus and of the tissue which intervenes between the pelvic viscera and the fixed structures of the pelvic floor.

There are, as has been mentioned by all the classical writers, various separable accidents favourable to the development of prolapse. One of these is direct injury to the pelvic floor during parturition. There is no doubt that forceps-delivery, before complete dilatation of the cervix, is an incident in the history of many cases.

Prolapse is constantly seen after the perineum has been torn; and many have concluded from this observation that the tear causes the prolapse. Tearing of the perineum, and injury or stretching of the pelvic diaphragm, widen the vaginal outlet and straighten the vaginal canal. Thus a loose uterus will descend more easily when the perineum has been torn. But a uterus that is not loose will not descend simply because the vagina is straight and has a wide outlet. It is a daily occurrence to see cases of badly-torn perineum without a trace of prolapse. Indeed, women who have been torn right through into the rectum very seldom have prolapse. They do not strain at stool; and, further, they are the possessors of tissues which tend to tear rather than to stretch. Women with prolapse have tissues which stretch and do not tear easily, as Ranken Lyle has pointed out. Common sense and logic agree that, as we see prolapse without tears and tears without prolapse, the one cannot be the cause of the other.

Increased size and weight of the uterus is of no importance. Large heavy uteri are constantly seen in perfect position, and in complete prolapse the uterus is often very light and small.

Increased intra-abdominal pressure has been called a cause of prolapse. When the organs are loose, it is intra-abdominal pressure, as raised during lifting, defaecation, coughing, and the like, which forces the loose organs downward. But pressure from above does not loosen the normally attached uterus, bladder, or vagina. Indeed intra-abdominal pressure tends to keep an anteverted uterus in a position of anteversion, and to this extent it prevents prolapse.

The uterus must be loose enough to permit retroversion before it can be driven downwards and displaced from its normal relationship to the fixed portion of the pelvic floor. Elongation of the cervical portion of the uterus favours retroversion,

because the long cervix lies in the vaginal axis and tilts the fundus backwards into the pelvic axis. Thus, elongation of the organ favours prolapse by favouring retroversion.

Pelvic infection tends to prevent prolapse by producing fibrous thickening and shortening of the pelvic connective tissue. It is the very tissues which provide the lateral attachments of the uterus, vagina, and bladder which are infiltrated and rendered rigid in typical pelvic cellulitis. This has been utilized by Inglis Parsons, who cures prolapse by injecting quinine into the parametria and so producing an artificial equivalent of cellulitis.

The atrophic changes of the menopause tend to favour prolapse by lessening the tone of the fibro-muscular tissue between the peritoneum and the pelvic diaphragm. It is true that these atrophic changes are generally compensated by corresponding narrowing of the vaginal outlet and the vaginal canal; they are accompanied by a reduction of the vascularity of the parts, and they are also accompanied in some patients by deposition of fat situated so as to lessen the discomfort caused by looseness of the uterus, bladder, and vagina. Thus in many cases patients begin to complain of prolapse, while in other cases they cease to complain of prolapse when they reach the menopause.

To sum up: The constant primary lesion which permits prolapse is relaxation of the subperitoneal fibro-muscular tissue which attaches the pelvic viscera to the fixed pelvic structures. The causes of this lesion are not fully known; the most common is probably superinvolution after pregnancy. When the lesion is present, the ordinary normal intra-abdominal pressure suffices to produce prolapse, that is, dislocation between the mobile and the fixed portions of the pelvic floor.

This dislocation is favoured by circumstances which increase the intra-abdominal pressure, and also by circumstances which injure the fixed portion of the pelvic floor.

COURSE AND SYMPTOMS

When the patient goes about with the inverted vagina hanging between the thighs, the vaginal surface becomes hard, dry, and skin-like. Excoriation is followed by infection and ulceration. The prolapsed mass is sometimes so enlarged by congestion and oedema that it cannot be restored to its place within the pelvis until its size has been reduced by prolonged rest in bed. Infection of ulcerated surfaces may extend to the peritoneal lining of the sac, and may produce adhesions between coils of bowel and the pelvic viscera. In rare cases fatal septicaemia

has occurred. Inflammatory infiltration and prolonged congestion often produce great thickening and rigidity of the vaginal walls.

Advanced prolapse is no doubt unfavourable to the occurrence of pregnancy. Considering the great frequency of prolapse and the great frequency of abortion, it cannot be stated that cases of abortion in prolapsed uteri are common.

The discomfort of patients with prolapse is increased during early pregnancy ; but after the uterus becomes an abdominal organ, its size keeps it in good position. Cystocele, however, aggravated by the hyperaemia of pregnancy, may be troublesome throughout pregnancy, and when there is much cervical elongation the soft, swollen, congested cervix may remain close to or outside the vaginal orifice until the onset of labour. Though retroverted, the prolapsed gravid uterus does not become incarcerated in the pelvis like the retroverted uterus which is not prolapsed, but has its cervix high up behind the pubic symphysis and its fundus low down in the pouch of Douglas. In prolapse the cervix is free to move downwards, and the fundus is free to grow upwards, so that incarceration does not occur.

The patient who has prolapse complains of discomfort in walking and sitting, and she may have difficulty in emptying the bladder. In the earlier stages of the development of the condition there may be considerable pain, but in marked cases this is generally absent.

There is nothing to be gained by discussing at length the symptoms of prolapse. A patient often says that she has falling of the womb, that the womb comes down, or that there is a swelling in the passage when there is nothing of the kind. The hyperaemia of menstruation, infective vulvitis, atrophic changes of the menopause, a urethral caruncle, indeed almost any gynaecological ailment may cause the patient to make the complaints enumerated in cases of prolapse. The process of eliciting a description of the subjective phenomena is irritating both to the patient and to her medical adviser, and in most cases it serves no useful purpose. In this, as in all gynaecological work, it is well to make the physical examination as soon as possible.

DIAGNOSIS

The diagnosis of the various conditions included under the term 'prolapse' is made by direct recognition of the physical signs. When the patient makes any complaint as to the condition of the external genitals, the parts should be inspected in a good light. This may be done with the patient lying on her side with the knees well drawn up ; but the inspection is more satisfactory if she lies on her back with the knees drawn up and widely separated. The foot of the couch

should face the window or other source of light, and the patient's limbs should be covered by a sheet or rug arranged so that the parts to be inspected are alone exposed.

In some cases, when there is but slight dislocation between the more mobile and the more fixed portions of the pelvic floor, it is useful to examine the patient in the erect posture. If the patient does not know how to 'bear down' when asked to do so, it may be that nothing appears at the vulvar outlet while she is lying down. Yet she may insist that something comes down when she is standing or walking. In these cases examination in the erect posture may reveal slight cystocele, or it may prove that the patient's complaint is merely subjective—that she feels as if something was coming down when this is not really so. Examination in the erect posture is very distasteful to most patients, and is strongly resented by some. It should therefore be avoided in general.

It is also useful, occasionally, to grip the cervix with a volsella in order to demonstrate by direct traction the range of mobility of the uterus. As a rule the volsella and the sound should be used only when the patient is on the operating-table, cleaned up, and already under anaesthesia; for in the consulting-room and the out-patients' department all unnecessary manipulation should be avoided.

The physical signs are as follows:

Cystocele.—The anterior vaginal wall is everted from below upwards when the patient strains, together with the urethra and the portion of the bladder which is in relation with the vagina, but the uterus remains anteverted.

Classical Prolapse. Stage I.—The anterior vaginal wall and the bladder descend as in cystocele. The uterus lies with its long axis in or behind the pelvic axis, and the os is nearer than usual to the vaginal orifice. The posterior vaginal wall is inverted from above downwards, with consequent shortening of the posterior vaginal fornix.

Classical Prolapse. Stage II.—The anterior vaginal wall is completely everted. The os uteri is at the vaginal outlet, the posterior vaginal wall being doubled on itself so that the vagina is shortened by one-half. There is no anterior vaginal fornix.

Classical Prolapse. Stage III.—The vagina is completely everted and contains the uterus, the appendages, and a portion of the bladder. When the parts are replaced and the patient strains, the anterior vaginal wall emerges first, the cervix next, and the posterior vaginal wall last.

Inversion of the Vagina from above downwards.—The os uteri is generally near, and may be outside the vaginal outlet. The uterus is long, and its long axis

lies in or behind the pelvic axis. The cervix is generally hypertrophied. The upper portion of the vagina is inverted and invests the descending cervix, so that the vagina is shortened. In ordinary cases there is no cystocele, and an anterior fornix persists even when the cervix is outside the vaginal orifice. If, however, the condition is so advanced that the whole vagina is inverted, a portion of the bladder descends with the anterior vaginal wall. To distinguish between this condition and the third stage of the classical prolapse, the parts must be replaced within the pelvis and the patient asked to bear down. In classical prolapse cystocele then appears, the anterior vaginal wall emerging first. In inversion from above downwards the cervix emerges first.

Rectocele.—The posterior vaginal wall is everted from below upwards, and contains a pouch of the rectum, which is demonstrated by passing a finger into it through the anal canal. The anterior rectal wall, being pathologically fixed to the posterior vaginal wall, moves with it. In other varieties of prolapse the anterior rectal wall maintains its ordinary position, and is but loosely attached to the posterior vaginal wall.

Differential Diagnosis.—Strictly speaking, there is no question of differential diagnosis when dealing with conditions which can be recognized positively by definite physical signs. Failure to diagnose the varieties of prolapse is always



FIG. 334.—Hypertrophy of vaginal cervix (anterior and posterior vaginal fornices unaltered, until cervix is pulled down).

due either to want of careful examination or to the loose and inaccurate use of terms. There are, however, various conditions which can be mistaken for one or other of the varieties of prolapse. Those which are mentioned in the following



FIG. 335.—Cyst of the anterior vaginal wall.

paragraphs are all conditions which have actually and repeatedly been referred to the writer by medical men as cases of prolapse.

Hypertrophy of the Vaginal Portion of the Cervix.—In typical cases of this true developmental condition, the vaginal fornices are not shortened by inversion of the vaginal wall from above downwards. The body of the uterus may remain anteverted and the elongated vaginal portion of the cervix occupies a vagina the relations of which to the adjacent structures are not altered. But no hard line can be drawn

between this condition and hypertrophy of the supravaginal portion of the cervix with inversion of the vagina from above downwards. "It is a dull and obtuse mind which divides in order to distinguish, but a still worse which distinguishes in order to divide." The distinction between hypertrophy of the vaginal portion and hypertrophy of the supravaginal portion is of no great use. Cases can easily be found which form a series complete from one extreme to the other.



FIG. 336.—Fibroid of the vaginal wall with ulceration.

Short Vagina.—In certain cases the anterior vaginal wall is very short, and the cervix is unduly near the vaginal outlet. The uterus is generally retroverted and often poorly developed. This is a developmental error, and not an acquired 'displacement.' Attempts to treat such cases generally end in failure to relieve symptoms.

Inversion of the Uterus.—This is recognized by noting the absence of the *corpus*

uteri from its usual position, the absence of the *os uteri*, and the presence of the openings of the Fallopian tubes.

Uterine Polypi.—When a fibroid polypus hangs in the vagina or outside the



FIG. 337.—Posterior vaginal enterocoele.

The swelling contained small intestine reducible through an opening into the pouch of Douglas.

vulva, the cervix is recognized surrounding the stalk of the growth, and the uterus is found in its usual position.

Cervical Fibroids.—Careful physical examination shows the relationship of the tumour occupying the vagina to the *os uteri*, and to the bladder, and rectum. The *corpus uteri* and appendages can generally be recognized above the tumour by abdominal palpation.

Vaginal Cysts.—Some of these cysts hang outside the vulva, and those lying between the anterior vaginal wall and the urethra and bladder may exactly reproduce the appearance of cystocele. The os is found high up above the swelling, and the nature of the condition is demonstrated by passing a sound into the bladder.

Fibroma and Myoma of the Vagina.—These tumours may protrude at the vulva, and, especially if the vaginal wall covering them is ulcerated, they may closely simulate the appearance of prolapse. The cervix is found up above the tumour, which may be either firm and solid to the touch, or may be soft and elastic so as to feel like a cyst. It may be necessary to explore the bladder or the rectum in order to complete the diagnosis.

Vaginal Enterocoele.—This rare condition may be mistaken for rectocele. It is possible to recognize the presence of intestine in a sac continuous with the pouch of Douglas. Rectocele is excluded by rectal examination. The writer has not met with any example of anterior vaginal enterocoele.

General Descent of the Pelvic Floor.—There is no dislocation or alteration of the relations between the pelvic structures. The uterus is anteverted, and there is no rectocele or cystocele. The pelvic floor, including the pelvic organs, is depressed in relation to the bony pelvis. Taking a base-line from the lower margin of the pubic symphysis to the tip of the coccyx, the bulge of the perineum below this line may be called the pelvic floor projection.¹ This is greater in parous women than in virgins, and when excessive (say over 1 in.) it constitutes 'general descent of the pelvic floor.' This is sometimes called 'prolapse.' It is a condition which does not require and indeed does not permit local treatment; though it may be associated with vague complaints of pelvic discomfort in hyperaesthetic women whose general health requires attention.

Retroversion.—Cases of retroversion with symptoms are constantly called 'prolapse.' The patient complains of 'bearing down,' a friend tells her she must have falling of the womb, she tells the doctor that her womb comes down, and he takes her word for it. On examination, there is no cystocele, the perineum is firm and complete; there is no rectocele, the cervix points forwards and often more or less upwards, and the fundus is felt behind it in the pouch of Douglas, often with one or both of the ovaries lying beside it. The uterus is loose, but the supports of the vagina and bladder are normal.

¹ Estimated at 2.5 cm. by Foster, *Amer. Journ. Obstet.* vol. xiii. p. 30, and at 3.2 cm. by Herman.

PROGNOSIS

All the varieties of prolapse tend to advance gradually from bad to worse, and they are all unfavourably affected by repeated pregnancy and parturition.

Those women who put on fat at the menopause often cease to complain of slight displacements of the pelvic organs which have previously troubled them more or less. On the other hand, the atrophic changes of the menopause very frequently favour the descent of the loose uterus, vagina, and bladder to an extent which leads the patient to seek treatment after the menopause for a trouble which she has tolerated during the greater portion of her reproductive life.

The patient's physical health is not directly affected by prolapse, but her condition is lowered by her inability to get about and take exercise with comfort; and her ability for work is often seriously impaired. In many cases extreme prolapse exists for many years without the slightest effect upon the nervous system. But in patients of the hyperaesthetic type, degrees of prolapse too slight to be noticed by the ordinary parous woman are associated with nervous symptoms which often disappear after the trifling lesion has been repaired. Indeed, it can be said that a successful operation for prolapse, done at the proper time, may prevent a sensitive woman from gradually becoming what is known as a hopeless neurasthenic.

There is no danger to life except in occasional cases. Infection of ulcerated surfaces may produce peritonitis and septic intoxication. G. F. Barbour Simpson¹ has recorded such a case. Neglected pessaries are generally the immediate cause of ulceration in such cases, which may be complicated by vesicovaginal and rectovaginal fistulae. Cystitis may follow incomplete emptying of the bladder in cystocele and advanced classical prolapse, with infection of the ureters and kidneys as a sequel. The prognostic fact that prolapse does not often threaten life has an important bearing upon the surgical treatment. For the cure of a condition which does not threaten life, the surgeon should not propose any operation which in itself exposes the patient to any risk beyond that inseparable from the administration of an anaesthetic and the making of an incision.

SURGICAL TREATMENT

History.—The history of the surgical treatment of prolapse is very interesting. It may be said to begin, about the middle of the nineteenth century, with tentative efforts to narrow the vagina and repair the perineum. The main line of evolution

¹ *Scottish Medical and Surgical Journal*, March 1905.

has always been marked by successive improvements in vaginal operations. But development in this direction was checked by the intervention of abdominal surgery in the treatment of prolapse. The early attempts at anterior and posterior colporrhaphy were not attended by brilliant success; and when it became possible to open the abdomen with comparative safety, operators began fastening the prolapsed uterus up from above as an alternative for repairing the pelvic floor from below. The evolution of plastic vaginal work was thus delayed for many years. But some time ago this abdominal phase in the surgery of prolapse passed its acme, and there is a general return to vaginal methods. Ideas have not been confined to the improvement of anterior and posterior colporrhaphy, for numerous offshoots and derivatives from these operations have appeared from time to time. Some of these have been merely suggested, some have been tried in a few cases, and others have become quite popular for a time.

One of the older operations which is still occasionally used is that described by Le Fort in 1877. This was designed to prevent eversion of the vagina by securing an area of union between the anterior and posterior vaginal walls. A strip of 'mucous membrane' less than an inch wide and as thin as possible was removed from each vaginal wall and the raw surfaces were drawn together with sutures of silver wire. Wyatt¹ recently drew attention to this device and to several variations of it. He mentioned eight cases of its use by Tate in women past the menopause. Catgut was used in place of silver wire, and the area of union was made about 1½ inches wide. Eden, Griffith, and Lockyer have also obtained satisfactory results by this method. The practical objection to the operation is that it prevents coitus and is thus of very limited scope. An operation which restores the parts to their normal relationships is preferable to one which fails to do so. Therefore, if it is possible to cure prolapse in old women by anterior and posterior colporrhaphy, Le Fort's is an unnecessary operation. Surgical 'substitution' is never permissible if the desired result can be secured by 'restoration.'

The term 'vaginal fixation' has been used for many operations. As generally accepted, at present, it implies the free separation of the bladder from the anterior uterine wall, followed by the inclusion of the anterior surface of the uterus in the stitches which close the incision in the anterior vaginal wall. In other words, that portion of the bladder which lies between the uterus and the vaginal wall is pushed out of the way, and the uterine wall is fixed to the vaginal wall. This is often done in combination with anterior colporrhaphy, and its result should be to secure anteversion of the uterus.

¹ *Proceedings of Royal Society of Medicine (Obstet. and Gyn. Sect.)*, vol. vi. No. 2.

The operation known as 'interposition'¹ is a further development of vaginal fixation which came from Vienna, and is associated (to their discredit) with the names of Schauta and Wertheim. The bladder is separated from the uterine wall until the peritoneal cavity can be opened by cutting through the peritoneum of the utero-vesical pouch. The uterus is then anteverted, and the fundus is delivered through the incision and pulled down into the vagina. If of reproductive age, the patient is then sterilized by the resection of a portion of each tube. The peritoneal cavity is closed by suturing the anterior margin of the incision in the peritoneum to the posterior surface of the cervix. The uterus is then placed so that its fundus looks downwards and its posterior surface lies against the bladder, while the cervix is directed upwards and backwards. The vaginal incision is then closed over the uterus, which is thus 'interposed' between the bladder and the vagina.

Gemmel says:² "I find that Schauta and his school have in seven years operated upon 89 cases by this method. Of the 89, 77 per cent were cured, recurrence was reported in 13; and 5 died." No results could be much worse than these. Five deaths out of 89 operations done for a condition which itself offers no risk to life is enough to damn the reputation of any surgeon, without considering the 13 failures. Gemmel reported 27 cases of his own with no death, bladder-trouble in one case being the only complication. He strictly limited the use of the operation to cases in which the menopause was past. Hellier³ reported a long series of cases in which anterior colporrhaphy was combined with amputation of the cervix, incision of the utero-vesical pouch, and partial salpingectomy. The uterus was then 'interposed' and sutured to the anterior vaginal wall, the incision being closed by a continuous catgut suture. His mortality was lower and the percentage of cures was higher than in Schauta's series.

The operation of interposition is unnecessary because prolapse can be cured without it, while it is unsurgical because it distorts the parts instead of restoring their normal relations. It is unsuccessful compared with much simpler methods. It is unsafe because numerous fatal cases have been recorded. Thus there is no reason for using this operation after the menopause, and during reproductive life it is positively objectionable.

Some operators have removed both the uterus and the vagina for prolapse, and vaginal hysterectomy for this indication is a common operation. At first the results of hysterectomy were very poor; for, though the uterus was removed, the vagina

¹ See also Article on Vaginal Coeliotomy (Vol. III. p. 630).

² *Trans. North of England Obstet. and Gyn. Soc.*, June 1912.

³ *Trans. Glasgow Obstetrical Society*, June 1911.

remained everted. The technique was then improved by combining the hysterectomy with extensive anterior and posterior colporrhaphy, and by taking special care to suture the parametria together in the middle line, so making a new transverse bridge across the pelvic cavity.

But the parametria can be united in the middle line without removing the uterus. Thus, in operating for prolapse, hysterectomy is unnecessary. It also adds to the risk of the operation. Further, to remove an organ without any special reason for doing so is very unsurgical. If, in addition to prolapse, the patient has a diseased uterus, the organ may sometimes be removed with complete justification and with great advantage. For example, many women near the menopause suffer excessively from menorrhagia and metrorrhagia. To operate on such a woman for 'prolapse' and then to have her complain for months of uncontrollable bleeding is very unsatisfactory. Thus hysterectomy, combined with a good plastic vaginal operation, is sound treatment when the uterus is so diseased that its removal is desirable apart from the presence of prolapse.

Lockyer¹ has recently described an operation in which the bladder is separated from the vagina and from the uterus, and is pushed up and invaginated. An antero-posterior mattress suture is then passed through the lower, or urethral, end of the invagination cup and through the cervix as high up under the peritoneal reflection as possible. When this suture is drawn tight the bladder disappears. The retracted *levator ani* and aponeuroses are next sought. "They lie far back under the ascending rami of the pubes, deep in the angle between the bladder and the vaginal flaps." These are brought together in the middle line by mattress sutures. The cervix, if hypertrophied, is then amputated by continuing the incision round behind it. The suture of the stump is done from back to front leaving a transverse line of stitches. The trimmed vaginal flaps are then brought together in the midline by a continuous catgut suture. This operation has certain disadvantages, though Lockyer has found it useful in about forty cases. The antero-posterior suture pulls the cervix forward and downward. The search for the levatores is troublesome. The union of their margins in front of the vagina is not anatomical and is unnecessary. The transverse suture of the stump of the cervix shortens the anterior vaginal wall and pulls down the cervix. This is aggravated by the use of a continuous suture for closing the incision. The result is that the cervix is left much too near the vaginal outlet with the uterus in retroversion, a position very favourable to recurrence.

The older writers thought it was all the structures composing the pelvic floor

¹ *Practitioner*, December 1913.

which together supplied the resistance to intra-abdominal pressure. A recent modification of the old view is an apotheosis of the *levator ani*. In his classical monograph on the pelvic musculature Peter Thompson¹ stated that these muscles act principally as sphincters of the rectum and also of the vagina, while their supporting action is indirect only. But Halban and Tandler² regard prolapse as a hernia of the 'levator opening,' and hold that its cause is congenital or acquired defect in or separation of *levator ani*.

It has been inferred from statements of this kind that, during the operation of perineorrhaphy, the *levator ani* should be sutured together in front of the rectum. This idea was taken up in Krönig's clinic in Freiburg. After working for some time, the operators found that they were not suturing the levatores but the *transversus perinei* muscles. They then dissected more extensively and cut through the *transversus perinei profundus* in order to gain access to the *levator ani*.

"Along with myorrhaphy of the levatores an anterior and posterior colporrhaphy is performed, and in addition an ante-fixation of the uterus by the Alexander-Adams operation or by a vaginal fixation."³ As all these measures are combined, it is not surprising that a large percentage of the cases are said to be cured. "The much more difficult technique of the suture of the levatores conduces to greater haemorrhage, and disposes to a higher mortality than does the very simple colporrhaphy."³ Thus there were three deaths from septic infection of the operation wound in 272 cases in Krönig's clinic!

Jellett⁴ condemns Döderlein, Krönig, and Martin because, though they are advocates of suture of the levatores, they convey the idea that the operation is difficult and not devoid of danger. But Jellett himself calls attention to the troublesome bleeding which may occur, and to the formation of dead spaces between the vaginal wall and the muscle. He criticizes Krönig's anatomy very severely, as also does Martin. There is, in fact, considerable difference of opinion among the advocates of muscle suture.

The *levator ani* of the two sides do not meet in front of the rectum, as a considerable quantity of fascial tissue intervenes between them. Their suture in that position is thus quite unsurgical. It is unnecessary because the union in the middle line of the fascial structures exposed in an ordinary perineorrhaphy secures a perfectly satisfactory restoration of the pelvic diaphragm and of the perineal muscles.

Abdominal Operations for Prolapse.—It has been mentioned that the develop-

¹ *Myology of the Pelvic Floor*, 1899.

² *Anatomie und Ätiologie der genital Prolapse beim Weibe*, 1907.

³ Schlimpert, *British Medical Journal*, Oct. 18, 1913.

⁴ *Medical Press and Circular*, Aug. 5, 1914.

ment of abdominal surgery delayed the advance of the operative treatment of prolapse by interfering with the evolution of anterior and posterior colporrhaphy. No device carried out by the abdominal route can cure cystocele or rectocele. At the best, abdominal operations could only be accessory to vaginal work in the treatment of prolapse. Yet numberless attempts to accomplish the impossible have been, and are still being made. Few surgical failures are commoner than those in which the fundus uteri is found firmly fixed to the abdominal wall above the pubes, while the cervix projects from the vulva accompanied by a considerable portion of both vaginal walls. The vaginal work, difficult as it is, must be done. Given that a moderately good vaginal operation has been done, but has left the uterus loose and retroverted, no doubt recurrence may be avoided by doing a ventro-fixation or a round-ligament operation, in addition. This is one way of curing prolapse. But it is better to do the vaginal work so well that it suffices by itself without the addition of the abdominal operation.

In considering this question it is essential to distinguish with perfect clearness between prolapse and retroversion. Numerous abdominal operations have been suggested for the correction of retroversion, and many of these have been used in the treatment of prolapse. This is logical in a way. The essential features of early classical prolapse are cystocele and retroversion. The operator does a vaginal operation for the cystocele and an abdominal one for the retroversion. But, if the vaginal work is well done, it will generally leave and keep the uterus in anteversion without the addition of a special operation for retroversion. And, further, numerous cases are cured of all the discomforts due to prolapse by vaginal operations, although they leave the uterus still retroverted.

The writer¹ formerly advised operators to do the vaginal work first, and if, on its completion, the uterus remained retroverted, to proceed at the same sitting to ventro-fixation or a good round-ligament operation to produce anteversion.

Additional years of experience have changed the writer's view, which now is that if the surgeon can do vaginal work well, no abdominal operation should be done for prolapse. If a patient were to come back a year after operation with a retroverted uterus, backache, pain in the sides, or dyspareunia due to prolapsed ovaries, it would no doubt be proper to open the abdomen and sling the uterus in anteversion by a Webster's or a Gilliam's operation. But this would be operating for retroversion, not for prolapse.

These remarks must not be taken to imply that in the normal subject the uterus is pulled forward by the round ligaments. Those who make observations when

¹ *Transactions of the Edinburgh Obstetrical Society, 1907-1908.*

the abdomen is open are well aware that the round and broad ligaments lie loose on the upper surface of the pelvic floor, and that their position is determined by that of the uterus. But the round ligaments can be utilized surgically so as to bring the loose retroverted uterus into a position of anteversion. When this has been done intra-abdominal pressure keeps the fundus forward. The round-ligament operations substitute one kind of anteversion for another, and do not restore the normal condition in which the cervix is held back and up by the parametric tissue, while the fundus simply lies forward and is pushed downward and forward by intra-abdominal pressure.

Recent Improvements.—Recent improvements in the surgical treatment of prolapse depend on the recognition of the fact that the uterus is supported by two lateral pedicles of parametric tissue which are continuous with the cervix and the upper part of the vagina. The essential lesion which allows of prolapse is elongation of these diffuse stalks or pedicles. Thus the object of surgical intervention is to shorten the pathologically elongated parametric tissues. They cannot be cut and absolutely shortened because they contain the blood-vessels, the lymphatics, and the nerves of the uterus, but they can be relatively shortened by making them follow a longer course, namely by drawing them together in the middle line in front of the cervix. This manœuvre pushes the cervix up and back into the hollow of the sacrum. It thus corrects retroversion, and this done, intra-abdominal pressure keeps the uterus in a position of anteversion. Recurrence of prolapse is thus prevented. It is not suggested that prolapse cannot be cured without securing anteversion, for experience shows that it is often done when prolapse is turned into retroversion without symptoms. But the normal position is anteversion, and a good operation should leave the uterus in the normal position.

This idea of bringing together in front of the cervix the firm parametric tissue normally situated at the sides of the cervix has received considerable attention. Thus Alexandroff¹ made a curved incision across the anterior vaginal fornix so as to allow free separation of the bladder from the uterus and the parametric tissue. He then passed temporary ligatures into the parametria about an inch and a half from the cervix on either side. By pulling on these ligatures the parametria were brought together in front of the cervix, which was thus lifted up and back in the pelvis. Sutures were then inserted to unite the lateral tissues with each other and with the cervix in the mid-line. The temporary ligatures were then removed, and the vaginal incision closed. This was published in 1903. Hastings Tweedy²

¹ *Zeitschr. f. Geb. u. Gyn.*, 1903, No. 25.

² *Journal Obstet. and Gyn. of British Empire*, May 1905.

described a similar operation in 1905, but he recommended opening the peritoneal cavity both in front of and behind the uterus, and detaching the vaginal wall from the parametric tissue on either side. A further method is figured and described by Dudley.¹ A \perp -shaped incision gives access to the field of operation, and a comparatively small portion of the anterior vaginal wall is removed. The anterior portion of each parametrium is cut from the cervix with scissors, and these cut portions are stitched together in front of the cervix, which is thus pushed upwards and backwards.

The writer could never see the advantage of using temporary ligatures or of cutting through part of the parametrium. But for years he was in the habit of pushing the bladder well up off the anterior surface of the uterus, and uniting the parametria in front of the cervix by buried catgut sutures before closing the vaginal incision. He then began to omit both of these details, and has not used either of them often in his last 250 or 300 cases. The separation of the bladder from the cervix increases bleeding and increases the area of raw surface; it also occupies a little time. The placing of buried sutures in the parametrium interferes with the blood-supply of the tissues and also takes time. The writer's cases do just as well when these stages of the operation are omitted; but he has no wish to criticize their use by other operators.

If the anterior half of the vaginal roof be separated from the adjacent paravaginal and parametric tissue and freely enough excised, the mere closing of the incision from side to side brings together in front of the cervix the tissue which formerly lay at its sides. This pushes the cervix upward and backward into the hollow of the sacrum, and corrects the retroversion which is an essential part of prolapse. Indeed, if the vagina is roomy enough to give access to its vault, retroversion without any prolapse can be corrected by an operation of this kind. There is no need to dissect the parametric tissues if they are laid bare by a sufficiently wide excision of the anterior vaginal fornix, and this is readily done as a mere modification of ordinary anterior colporrhaphy. This extension of the upper portion of the colporrhaphy-incision outwards and backwards to the sides of the cervix is one of the means of ensuring success which the writer described some years ago.²

To spare a long cervix is to court recurrence of prolapse. In young women who may have children, the cervix should not be removed without due consideration; but the object of the operation is to cure the prolapse, and not to increase the family, and, if in doubt, the successful operator will amputate the cervix rather

¹ Dudley's *Text-Book of Gynaecology*, 5th ed., 1908.

² *Transactions of the Edinburgh Obstetrical Society*, 1907-1908.

than leave it. In older women there is no object in sparing the cervix, and it should be removed if it is unhealthy, or if the uterine cavity is over 3 inches in length. It has long been the custom, when operating for prolapse, to begin by dilating, curetting, and amputating the cervix in the ordinary way, closing the incision by fore-and-aft sutures so as to leave a transverse line of stitches with the *os uteri* in its centre. This is not a good preliminary to an extensive anterior colporrhaphy. Also, it shortens the anterior vaginal wall, tends to draw the cervix downwards and forwards, and so tends to perpetuate retroversion, which, in turn, favours the recurrence of prolapse.

When it is decided to amputate the cervix a very useful alternative course is to dilate, curette, and then proceed to make the anterior colporrhaphy-incision at once, carrying the incision round behind the cervix instead of across in front of it. The vaginal wall to be removed is then separated until it remains attached only to the cervix. The cervix is next set free as far as necessary, and lastly, the cervix is cut through, the vaginal wall and the cervix coming away in a single piece. The stump of the cervix is then stitched into the upper angle of the incision, the remainder of which is closed from side to side, working from above downwards.¹

A golden rule in operating on the anterior vaginal wall is to put in no fore-and-aft sutures. The closing of any part of the incision transversely pulls the cervix down and forward by shortening the anterior vaginal wall. The object is to push the cervix upward and backward, and for this the anterior vaginal wall must be kept long or even lengthened. For this reason no continuous suture should be used in anterior colporrhaphy, and mattress sutures should be avoided because they also shorten the incision. When these operations are well done the upper part of the incision disappears from view as the lower part is closed. The incision should be so made that it cannot be closed from side to side until the uterus is pushed into the vagina and into anteversion. Thus the sutures must be tied inside the vagina. If the sutures can be tied with the uterus outside, the wound is not wide enough, and the operator is leaving too much to be accomplished by his work on the posterior vaginal wall. In other words, the restoration of the parts should not be left to depend on the repair of the perineum. When the anterior part of the operation has been done the cervix or its stump should be out of sight, far back and high up, the uterus should be in anteversion, and there should be no cystocele.

The perineum is then repaired because it is always either torn or stretched, and it is desirable to restore to the vagina its normal narrowness, its normal slope,

¹ *Journal of Obstetrics and Gynaecology of the British Empire*, July 1913 and July 1914; also *British Medical Journal*, April 12, 1913.

and its normal curve. In doing this it should not be narrowed so as to make coitus difficult or impossible. If the anterior operation is well done, extreme narrowing of the vagina is not necessary or desirable. At the end of the operation the vaginal orifice should admit a large finger without straining the stitches. When the catgut is absorbed the orifice becomes a little more roomy at once, and, subsequently, it quickly regains its normal capacity.

There are various good ways of doing these operations on the anterior and posterior vaginal walls, and cervix. It is best for each operator to work out methods that suit himself and the circumstances under which he operates. The writer, for example, sometimes begins with a median incision and works outwards, sometimes begins at the cervix and works down, sometimes begins below and works upwards. There is no best way for all cases. Sometimes the cervix is trimmed and repaired without amputation. Whenever the uterus is large, whenever there is menorrhagia or uterine leucorrhoea, and whenever the cervix is amputated, the operation is begun by dilatation of the cervix and curetting. But, if the uterus is healthy and the menstrual function is normal, there is no object in spending time in this way.

No sutures which require removal should be placed within the vagina, for when these operations are properly done the lines of incision become very inaccessible. To remove silkworm gut or silk stitches is a trouble for the surgeon and a torture for the patient to which she should never be submitted. Ordinary catgut, which resists absorption for ten or twelve days, is satisfactory for most of the work. For security, some of the more important sutures may well consist of thinner catgut which has been hardened by formalin or chromic acid to resist absorption for three weeks. This material is specially suitable for stitching the vaginal wall to the cervical stump, for holding together in the middle line the upper portions of colporrhaphy incisions, and for buried sutures in the perineal body. On the surface of the perineum, silkworm gut may be used, as it is easily removed from that position. It is easier for nurses to keep the external parts clean and dry when silkworm gut is used on the perineal surface. The ends of silkworm gut sutures should be left long and knotted together, both to avoid pricking and to facilitate their removal twelve or fourteen days later. When the operation is concluded the vagina should not be packed with gauze unless it is necessary to check oozing of blood. For the removal of packing is a trouble and hurts the patient; it also disturbs the lines of suture and interferes with healing. When there is troublesome bleeding, vaginal packing makes the best of a bad job. The packing should be removed in from twenty-four to thirty-six hours, and should not be replaced.

Preliminaries.—If it can be avoided, these operations should not be done just

before a menstrual period is expected. The menstrual discharge dilutes the normal vaginal secretion and lessens its acidity. Thus infection of the lines of suture is more likely to occur if menstruation begins three or four days after the operation. The result is not serious, but when convenient the operation should be done during the first half of the intermenstrual period.

Plastic vaginal work should not be done, as a rule, during the first four or five months after parturition. The parts are then unduly vascular and friable. Bleeding is so free that the work is rendered difficult, and the sutures often cut out. The hyperaemic tissues heal quickly once the operation is done; but to do it well and quickly is much easier when five or six months have elapsed after a confinement.

Ulceration of the cervix or vaginal walls, and septic conditions of the vulva, vagina, or uterus are also reasons for delaying operative work. It is possible to treat some of these conditions while the patient is up and about; but, when prolapsed organs are ulcerated, congested, and oedematous, rest in bed is essential. Treatment may be begun by thorough cleaning with strong antiseptics, active swabbing and scrubbing being used as well as mere douching. The vagina should be kept loosely and lightly packed with gauze, and the use of medicated pessaries between dressings may be of advantage. As the parts become clean, strong antiseptics should be replaced by mild ones, and operation should be postponed, if possible, until the use of lotions and packing has been stopped for a few days.

In ordinary cases the vagina and uterine cavity are free from pathogenic organisms and require no special preparation for operation. Indeed, care should be taken to avoid irritation of the surfaces by unnecessary scrubbing and douching with antiseptic washes. All that is required can be done in a few moments after the patient is anaesthetized and on the table.

After Treatment.—During after treatment, if all goes well, vaginal douching should be avoided. It is troublesome, disturbs the lines of incision, interferes with healing, and favours the occurrence of bleeding. When the catgut begins to come away, occasional douches with very mild antiseptic lotions aid its escape. If there is any purulent or offensive vaginal discharge during healing, antiseptic douches are required, and the patient should sit up all day so as to favour vaginal drainage.

It is very seldom that the catheter is needed after operations for prolapse, and its use should be forbidden unless the circumstances are quite exceptional. The bowels should be moved on the second or third day after the operation and every day subsequently. The external parts should be cleansed after every motion of the bowels as well as at regular intervals. There is occasionally some bleeding

ten or twelve days after operation when the catgut begins to give way. When this occurs there has generally been some septic infection of the vagina. Bleeding of this kind is seldom of any importance; it should, however, be distinguished from menstruation, and the patient should be kept in bed longer than usual, say for three weeks instead of the more usual fortnight.

Results of Vaginal Operations.—It may be stated with confidence that the results of vaginal operations for prolapse are good and permanent. The vagina, bladder, and rectum are restored to their normal condition in almost every case. The uterus remains retroverted in a certain proportion of cases unless special care is taken to secure anteversion. The symptoms due to the prolapse are generally completely relieved, whether the uterus remains anteverted or not. Women who have prolapse often have aches and pains which are not due to the prolapse, and which, it is needless to say, continue after operations which are anatomically successful. Many patients go through pregnancy and labour after vaginal operations without reproducing prolapse. In other cases there is slight recurrence, and the operations may have to be repeated some months after parturition. This estimate of the value of vaginal operations for prolapse has been formed after prolonged and extensive observation. In the industrial districts these measures are very widely used, and form an important proportion of the gynaecological work done. Thus in the Gynaecological Department of the St. Mary's Hospitals for Women and Children, Manchester, during the year 1913, the honorary and resident staff did 2207 operations. Anterior colporrhaphy and colpo-perineorrhaphy or perineorrhaphy were done in combination 355 times, the cervix being removed in about one-fourth of these cases. There were also 124 operations on the posterior vaginal wall and perineum only. Vaginal hysterectomy was done for prolapse 7 times, and vaginal fixation 20 times. Plastic vaginal work thus formed roughly a fourth part of the whole operative work done. The same proportion holds in the Gynaecological Department of the Manchester Royal Infirmary.

It is not possible to give any statistical account of the remote results of the work of these Institutions. The writer's personal impression is that the few patients who return after months or years for further treatment fall into three main classes: (1) those, whose cervixes should have been amputated, but have been spared; (2) those who have had pregnancies subsequent to operation; (3) those whose uteri remain markedly retroverted after operation. The following figures, though so few in number, are interesting owing to the frequency with which parturition followed operation. Early in the year 1914, Dr. M. Moritz, in the course of a clinical investigation, saw and examined 19 of the women who had been operated

on for prolapse by the writer during the year 1911 (before colporrhaphy and amputation of the cervix by one incision was in use). In 1 case the operation was done before an ulcer was healed; suppuration and haemorrhage occurred during healing, and the result was poor. In the other 18 cases the result was good. Eleven of the women stated that they were perfectly cured. In 8 of these the pelvis was normal, while in the other 3 the uterus was retroverted. Seven women had slight symptoms although the anatomical result of the operation was good as regards prolapse. In 3 of these 7 patients the uterus was retroverted. Four of the 19 women had been pregnant since the operation. The first had a premature labour thirteen months after operation without any return of prolapse or of symptoms. The second had a precipitate labour although the cervix had been amputated. Her perineum was slightly torn. The uterus was found to be retroverted with slight symptoms. The third and the fourth patients had easy normal labours at term and were anatomically perfect and free from symptoms when examined. None of these 19 women returned to hospital requesting further treatment.

The writer omits all reference to published statistics because the personal equation of the reporter plays so large a part in their construction that their value is very doubtful. Births, deaths, and marriages can be tabulated, but not cures and relapses in groups of hundreds.

Table of Appropriate Operations for the Four Types of Prolapse

Type I. Cystocele.

- (a) Anterior colporrhaphy.
- (b) Perineorrhaphy.

Type II. (1) Classical prolapse.

- (a) Anterior colporrhaphy with extension of the incision outwards and backwards into the lateral vaginal fornices, *i.e.* with excision of the anterior fornix.
- (b) Perineorrhaphy.
- (2) Classical prolapse with long or unhealthy cervix.
 - (a) Anterior colporrhaphy with excision of the anterior vaginal fornix and amputation of the cervix by one incision.
 - (b) Perineorrhaphy.

Type III. Inversion of the vagina from above downwards.

- (a) Amputation of the cervix with excision of the anterior vaginal fornix by one incision.
- (b) Perineorrhaphy.

Type IV. Rectocele. Colpo-perineorrhaphy.

OPERATIONS ON TYPICAL CASES

Each of the following summaries describes a useful method of treating one of the common types of prolapse. In each case, if it is thought desirable, the cervix should be dilated and the uterus curetted as a preliminary. When there is rectocele the perineum should not only be repaired, but a portion of the posterior vaginal wall should be excised (see Fig. 350, p. 679). The cervix may require trimming and repair of lacerations in cases in which it does not demand amputation.

Type I. Cystocele.—*Anterior Colporrhaphy and Perineorrhaphy.*—Pull down the cervix with a volsella, and mark out on the anterior vaginal wall an oval or diamond-shaped area. The upper end of the incision is marked by a pair of forceps applied at the cervico-vaginal junction. The lower end is marked by a pair of forceps placed half an inch behind the urethral orifice. The width of the area to be denuded must be judged for each case, according to the degree of cystocele present.

Make the incision through the whole thickness of the vaginal wall. Strip off from the bladder and urethra the portion of vaginal wall surrounded by the incision. One or two bleeding points on the exposed bladder may require tying with fine catgut. Bleeding from vessels in, and under, the cut edges of the vaginal wall will be controlled by the sutures which close the incision from side to side. These are interrupted sutures—not continuous or mattress sutures. The first is inserted at the cervical end of the incision, the others following in series from above downwards. Before those sutures which close the widest portion of the wound are tied, the uterus must be pushed well upward and backward, so that the sides of the wound can be approximated without tension. The cervix should pass out of sight as the lower part of the wound is sutured. Oozing is easily checked, as a rule, by extra sutures inserted at the bleeding points of the incision. When this has been done the perineum should be carefully repaired so as to restore the normal slope and curve of the vagina.

In slight cases anterior colporrhaphy is more troublesome than in pronounced cases. Often the patient complains of something coming down when there is no real cystocele, but when a torn perineum leaves exposed the lower part of the anterior vaginal wall. In these cases anterior colporrhaphy is troublesome and unnecessary. All that is required is to restore the slope, curve, and narrowness of the normal vagina by a well-judged repair of the perineum.

Perineorrhaphy.—A good method is to pick up the anterior skin-margin of the perineum in the mid-line with a pair of forceps. Next pick up two points, one on the margin of each *labium minus*, which will come together later,

and which thus determine the length of the skin-surface of the new perineum. Next pick up two points at the level of the hymen, one on either side, which will come together later and determine the size of the new vaginal orifice. These two points should meet easily behind a finger placed in the vagina. The incision connects the five pairs of forceps. The integument in front of the incision is then separated from the subjacent structures, any scar-tissue which is present being snipped free from the perineal body. A Λ -shaped portion of the posterior vaginal wall is then separated from the anterior rectal wall and cut away. The vagina is then sutured from above downwards by stitches whose knots are tied in the vagina. The sides of the new perineal body are brought together by buried sutures of catgut, reinforced by three or four silkworm-gut sutures, which also bring together the skin-margins and are tied on the perineal surface. It is quite unnecessary to dissect out the margins of the *levator ani* and suture them together. These muscles do not meet in the middle line in front of the rectum. They are, however, bound to the vaginal walls and to one another by fascia continuous with the perineal body. This fascia is exposed on either side of the wound when the Λ -shaped portion of the posterior vaginal wall is cut away. The apex of the new perineal body is formed by bringing together the fascia from the two sides in the middle line with buried sutures. Nor is it necessary to dissect out the *transversus perinei* muscles. The fascia which is exposed by the original wound is brought together in the middle line, and forms the base of the new perineal body. The operation should not be done in a spirit of wooden routine. Examination should show the direction, site, and extent of the original tear, and, in each case, the operation should be modified so as to restore the parts as nearly as possible to their original state.

Whether the skin-incision is made first and the work done from below upwards, or whether the operation is done from above downwards, as described under the heading 'Colpo-perineorrhaphy,' the wound as it affects the vulva, perineum, and perineal body is just the same. Its appearance is shown in Figure 350, p. 679.

Type II. Classical Prolapse.—1. *Prolapsus with Short Uterus and Healthy Cervix. Anterior Colporrhaphy with Excision of the Anterior Fornix and Perineorrhaphy.*—Pull down the cervix with a volsella and pick up with forceps two points in the lateral fornices directly right and left of the *os externum*, and about 3 inches apart. Push the cervix back into the hollow of the sacrum and see if the forceps will come together in front of it without undue tension. If they approach each other too easily, move them wider apart. If they will not meet, move them nearer together, and so on until suitable points in the lateral fornices are found. Pick up a third point half an inch behind the urethral orifice. Cut through the whole

thickness of the vaginal wall between the three pairs of forceps so as to mark out a triangle with its base just in front of the cervix, and its apex just behind the urethra. Separate and remove the triangle of vaginal wall. Close the wound from side to



FIG. 338.—Prolapsus exposed for operation.

(For illustrative purposes a large retractor is figured throughout this series, the field of operation appearing relatively small. The parts also appear to be more outside the vagina than in life. The retractor is not used in operating as a rule.)

side with interrupted catgut sutures. The first stitch is passed just in front of the cervix, in the centre of the base of the triangle, which is pulled first into a diamond-shaped figure and then into a median line as the suturing from above downwards proceeds. All but the first three or four stitches must be tied with the uterus pushed

well up into the vagina. The cervix should disappear from view as the lower stitches are inserted and tied. This operation alone would cure prolapse, without any repair of the perineum. But the vagina should be restored to its normal size, shape, and position. Thus perineorrhaphy by a good method should always be done,

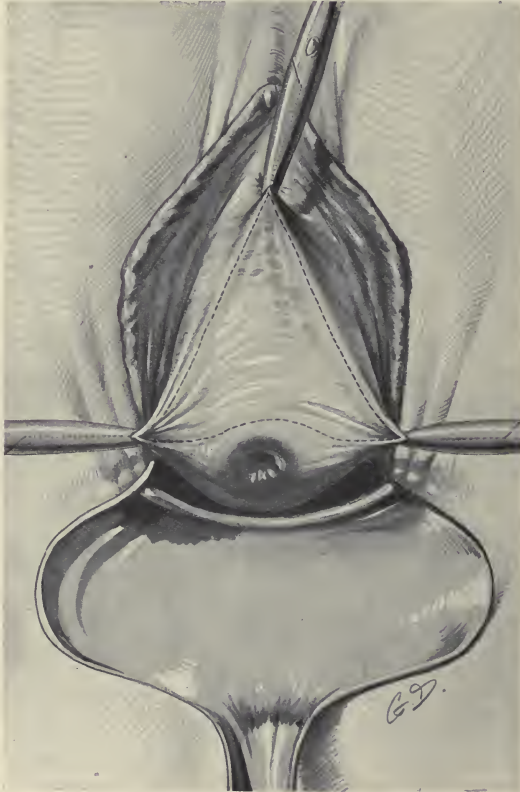


FIG. 339.—Operation for prolapsus.
Incision for anterior colporrhaphy without amputation of cervix.

after bleeding from the anterior colporrhaphy wound has been checked, if necessary, by the insertion of extra sutures.

2. *Prolapsus with Long Uterus or Unhealthy Cervix. Anterior Colporrhaphy with Excision of the Anterior Fornix combined with Amputation of the Cervix. Perineorrhaphy.*—Pull down the cervix with a volsella, dilate it, curette, and

measure the length of the uterine cavity, thus ascertaining how much cervix will have to be removed in order to leave a uterine cavity 3 inches long.

Pick up the vaginal wall at two points in the lateral fornices directly right and

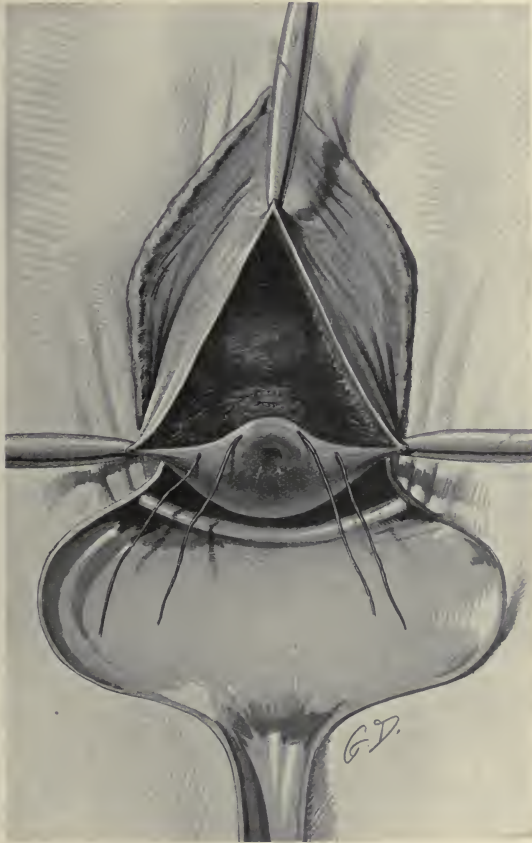


FIG. 340.—Operation for prolapsus without amputation of cervix.
Triangle of anterior vaginal wall removed to expose parametrium and paravaginal tissue. The first and second sutures are shown.

left of the os externum (or even a little behind it), and about 3 inches apart. Apply another pair of forceps half an inch behind the urethral orifice, and a fourth behind the cervix at the cervico-vaginal junction in the middle line. Cut through the vaginal wall so that the incision joins the four pairs of forceps and marks out for

removal a quadrangular area with two long sides in front and two short sides behind. Strip off this quadrangle of vagina wall from the urethra, bladder, and parametric tissue, working from below upwards until it remains attached only round the cervix.

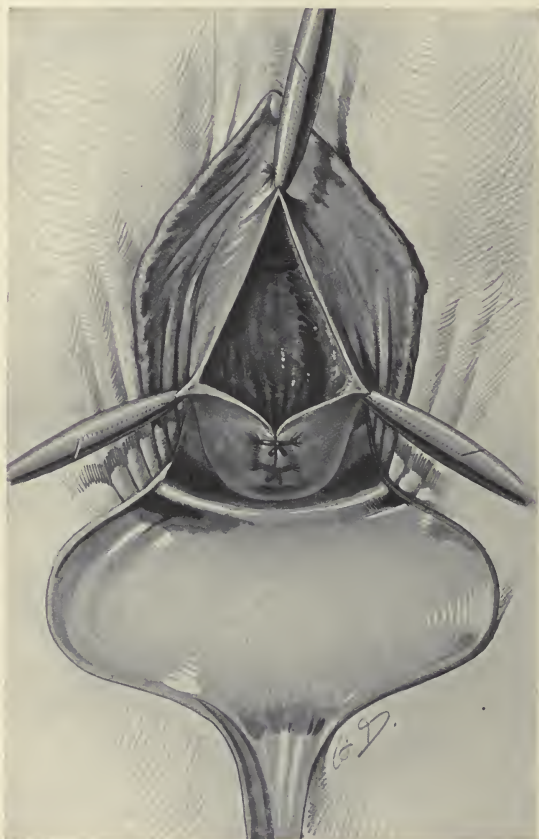


FIG. 341.—Operation for prolapsus without amputation of cervix.

As the incision is closed, the cervix disappears upwards and backwards. For purposes of illustration it is here shown pulled more downwards and forwards than it is in practice.

Then, pulling on the flap of vaginal wall, snip round and round the cervix until a sufficient portion of it is set free. Then cut straight across the cervix so as to leave the uterus with a cavity 3 inches long. The amputated portion of the cervix thus comes away in one piece with the quadrangle of vaginal wall.

Pass the first suture of hardened catgut into the cervical canal in the mid-line behind, and bring it out through the vaginal wall in the mid-line behind. Tie this and insert the second to the left of it so as to unite cervical mucosa and vaginal wall.

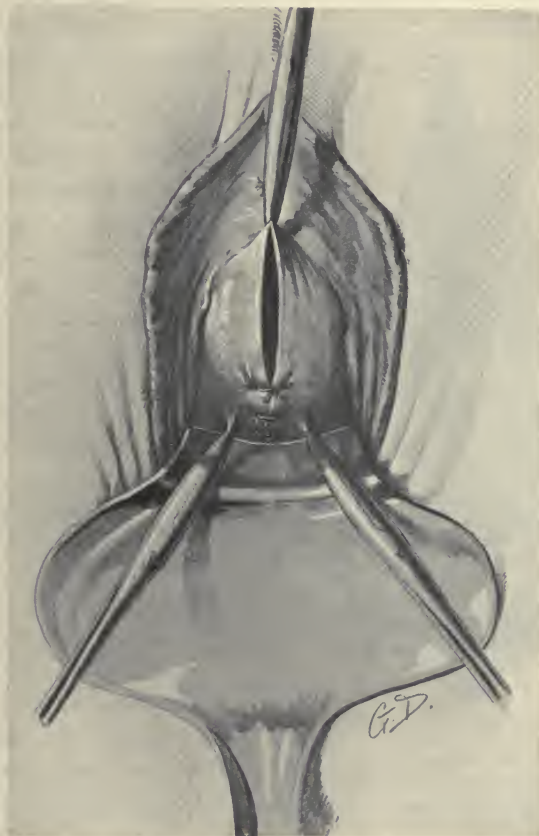


FIG. 342.—Operation for prolapsus.

The cervix has disappeared and lower part of incision is held forward by forceps for purposes of illustration.

Tie this and insert the third to the right of the first. The fourth is on the left, the fifth on the right, and so on, until the cervical stump is covered, and the new os externum is surrounded by vaginal wall.

Next insert a stitch through both vaginal edges of the wound and bring them together in front of the cervix. In order to tie this stitch without tension, the

stump of the cervix should be within the vagina, and should be pushed up and back towards the hollow of the sacrum. The remaining sutures are passed from side to side through the cut margins of the vaginal wall, and are inserted in series from above downwards. They are tied inside the vagina, and as the sides of the wound



FIG. 343.—Operation for prolapsus by amputation of the cervix, combined with anterior colporrhaphy.

The specimen consists of the portion of vaginal wall removed together with the cervix.

come together, the stump of the cervix, with the upper part of the line of sutures, passes completely out of sight upwards and backwards. For this reason bleeding should be checked as the suturing proceeds; for once the lower stitches are tied, the upper ones cannot easily be brought down into view again.

This operation leaves the uterus in a position of anteversion, and repair of the perineum is not required to cure the prolapse. But it is desirable to restore the natural size, shape, and slope of the vagina, for a defective perineum is a separable accident favourable to the recurrence of prolapse. Therefore the operation should be completed by repairing the perineum (see p. 677).

Type III. Inversion of the Vagina from above downwards.
—*Amputation of the Cervix with Excision of the Anterior Vaginal*

Fornix. Perineorrhaphy.—There is no cystocele, therefore it is not necessary to interfere with the lower portion of the anterior vaginal wall.

Pull down the cervix with a volsella. Dilate the cervix, measure the uterine cavity, and note that it is considerably elongated. It is permissible to amputate the redundant portion of the cervix by any method and to repair the perineum. But the result is much more elegant if the amputation be combined with excision of the anterior vaginal fornix. For this does not, like ordinary amputation, shorten

the anterior vaginal wall and so draw down the cervix. Further, it leaves the uterus anteverted instead of leaving it in a position of retroversion which is favourable to recurrence.

Pick up with forceps a point in the mid-line about midway between the urethral

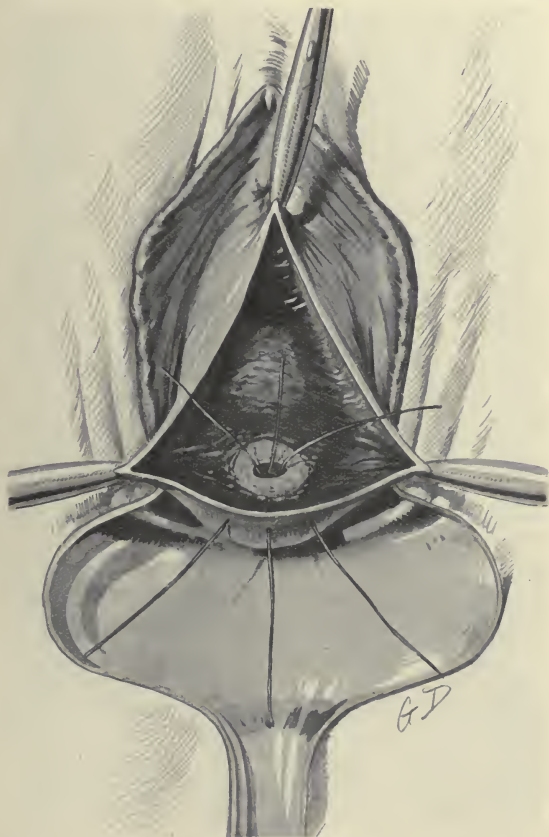


FIG. 344.—Operation for prolapsus by amputation of the cervix, combined with anterior colporrhaphy. The incision is made, the vaginal wall and cervix have been removed, and the first three stitches inserted.

aperture and the os externum. Pick up two points right and left of the os externum and about three inches apart. Pick up a fourth point in the mid-line behind the cervix at its junction with the posterior vaginal wall. Cut through the vaginal wall between the four pairs of forceps so marking out a comparatively small quadrangle

of vaginal wall for removal together with the cervix. Separate this from the subjacent tissues, working from below upwards; and, pulling on it, snip round and round the cervix until a sufficient length has been set free. Then cut straight through the cervix so as to leave the cavity of the uterus three inches long. Insert

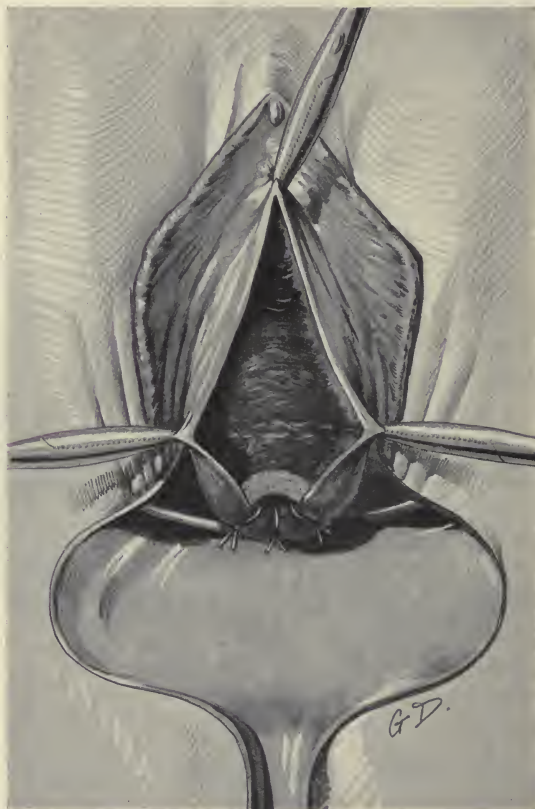


FIG. 345.—Operation for prolapsus by amputation of the cervix combined with anterior colporrhaphy.
The first three stitches are tied.

the first suture from the cervical canal to the vaginal wall in the mid-line behind. Pass the second on the left of the first, the third on its right, and so on alternately, working forward until the stump of the cervix is covered, and the os is surrounded by vaginal wall. Then close the remainder of the incision from side to side, tying

the stitches inside the vagina. The stump passes out of sight upwards and backwards, and the uterus is left in anteversion. The perineum is stretched in nulliparae, and both torn and stretched in parous women; therefore it should be repaired carefully before the patient leaves the table.

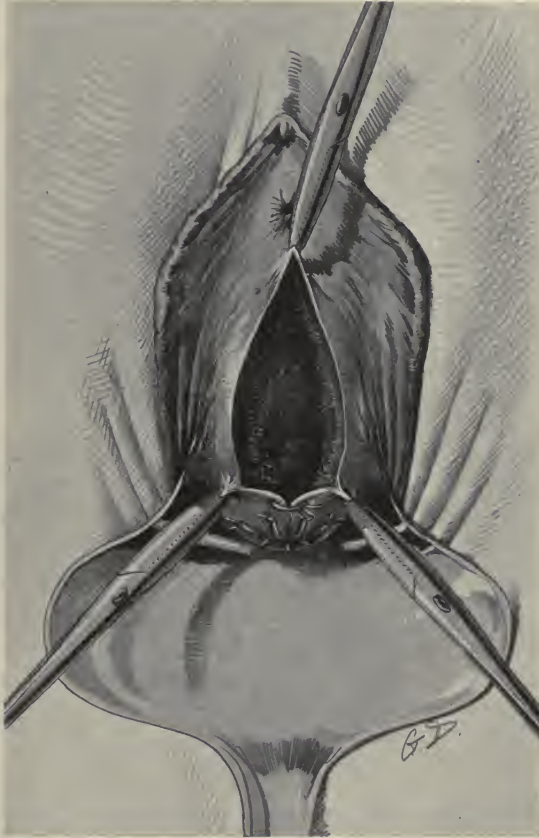


FIG. 346.—Operation for prolapsus by amputation of the cervix combined with anterior colporrhaphy. The suturing of the new os uteri is completed, and the first stitch from side to side has been inserted.

Type IV. Rectocele.—*Colpo-perineorrhaphy.*—This operation can be done by beginning as for an ordinary perineorrhaphy, and going on separating the anterior rectal wall from the posterior vaginal wall from below upwards as far as it may be necessary to free the two from one another.

But when any considerable degree of rectocele exists it is easier and better to work in stages from above downwards, as described by Professor Donald.¹

Pick up with forceps the highest point easily accessible in the mid-line on the posterior vaginal wall. This is generally an inch or so below the cervico-vaginal

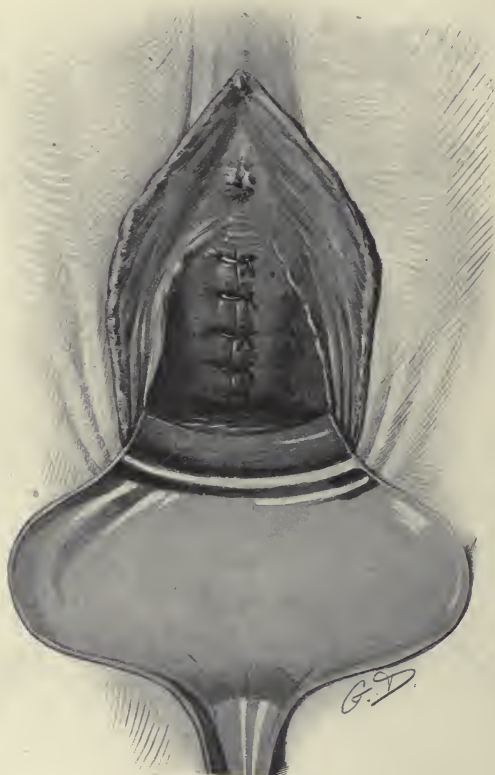


FIG. 347.—Operation for prolapsus by amputation of the cervix combined with anterior colporrhaphy. The suturing of the wound completed, showing that the stump of the cervix and the upper part of the wound have disappeared from view.

junction. Pick up two more points, one and a half inches from the first, lower down on the vaginal wall, and an inch or more apart. Cut through the vaginal wall so that the incision connects the central point with both the lateral points.

¹ See *Journal of Obstet. and Gyn. of British Empire*, March 1908.

Separate the A-shaped triangle of vaginal wall from the rectum by traction combined with snipping, but do not cut it off.

Working from above downwards, close the triangular wound from side to side



FIG. 348.—Colpo-perineorrhaphy from above downwards for rectocele.
The incision for the first stage is marked.

with three or four catgut stitches, cutting short the first as soon as the second is tied. Next pick up two points, one on each side of the vaginal orifice, which will just meet behind a finger placed in the vagina. Continue the lateral incisions down to these points, and separate the corresponding area of vaginal wall from the rectum

and from the other subjacent structures so freely that the rectum drops back out of the way. Next pick up two points one on the margin of each *labium minus* which, on being brought together, will form a suitable anterior limit for the new perineum. Continue the lateral incisions to these two points, and separate the remainder of

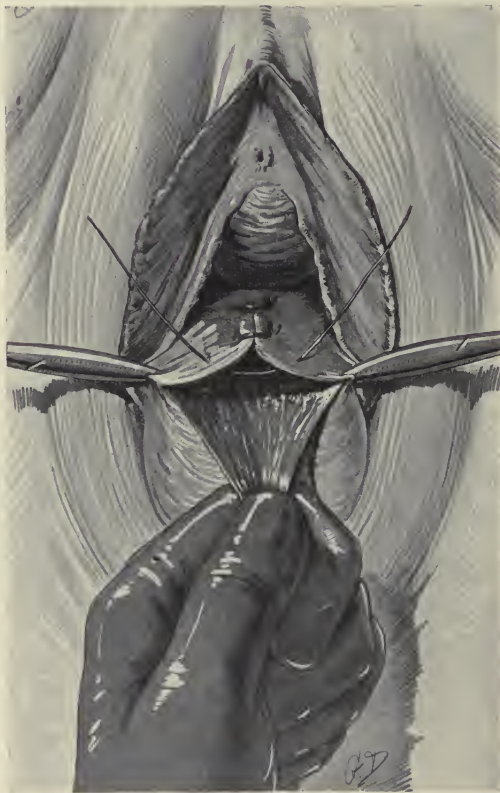


FIG. 349.—Colpo-perineorrhaphy.

The flap of vaginal wall has been separated from the rectum and the wound is being closed from side to side, so ending the first stage.

the posterior vaginal wall from the perineal body until the skin-surface is reached. Cut away the flap of tissue which has been separated. Form the new perineum by drawing together the sides of the wound with buried sutures. Complete the suture of the posterior vaginal wall with catgut stitches. Close the portion of the

wound which is on the perineal skin-surface with three or four sutures of silkworm gut. No dead spaces should be left within the wound. It is not necessary to seek for the *levator ani* or any other muscles. The fascial structures are sufficiently exposed in making the wound described. No object is gained by suturing muscle to

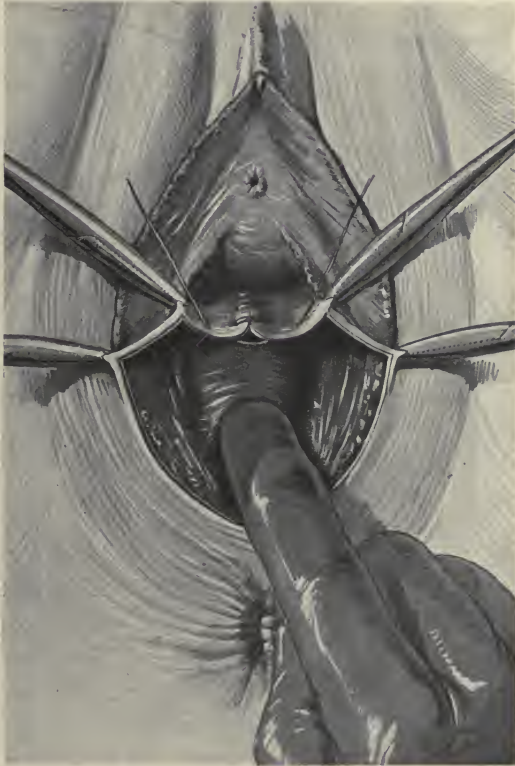


FIG. 350.—Colpo-perineorrhaphy.

The incision has been completed. The whole of the flap of vaginal wall has been separated from the rectum and perineum, and cut away. The finger touches the rectum at the apex of the perineal body.

muscle. At the end of the operation the vaginal orifice should admit one finger. If there is much oozing the vagina may be packed with gauze, but this is seldom required.

Repair of complete Perineal Tears.—It has been mentioned that patients with prolapse very seldom have tears extending through the perineal body and sphincter ani into the anal canal. Some persons have tissues which stretch more readily than

they tear, and these are the victims of prolapse. Those with complete perineal lacerations have rigid tissues which tear before they stretch. For the sake of completeness, however, the repair of complete lacerations is described.

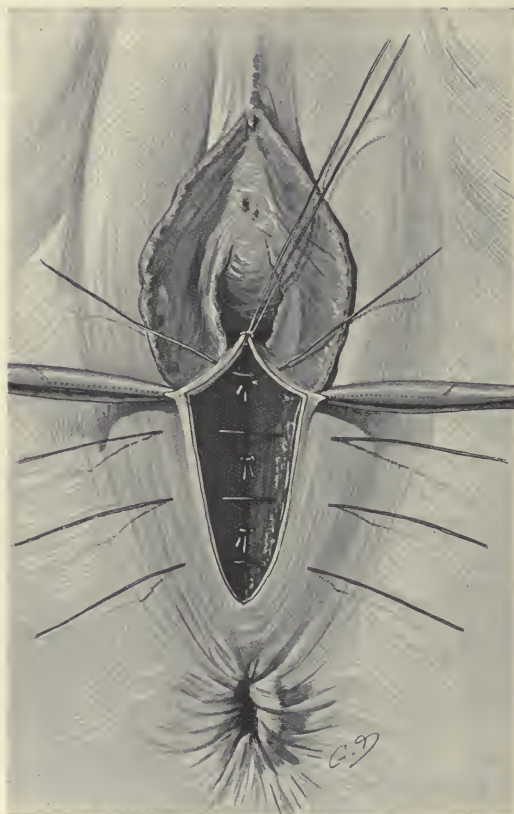


FIG. 351.—Colpo-perineorrhaphy.

The stitching of the vaginal wall has been finished. Buried sutures have been placed and tied in the perineal body. Superficial sutures have been inserted in the vulva and on the perineal surface, but not tied.

Inspection shows that the radiating folds in the skin round the anus are altered in their disposition after lacerations extending through the sphincter. Instead of running outward from all around the anus the folds radiate from its posterior portion only. The position of the anterior skin-folds on either side indicates the position of the torn end of the sphincter on that side, and thus tells the operator

where his skin-incision should begin. Pick up, therefore, with forceps, a point on the anterior skin-fold on each side about half an inch outside the junction between the skin and the mucosa of the anal canal. Next pick up two points, one on the



FIG. 352.—Colpo-perineorrhaphy.

The completion of the operation, showing restoration of vaginal orifice, vulvar cleft, and perineum.

margin of each *labium minus*, which when brought together will determine the anterior margin of the new perineal body. Next pick up two points at the level of the hymen which will come together easily behind a finger placed in the vagina. These points determine the size of the new vaginal orifice (see Fig. 352).

The first two pairs of forceps applied being drawn steadily apart, make a deep incision between them which separates the anal wall from the vaginal wall, and

exposes the torn ends of the sphincter. This is best done with sharp-pointed scissors. Next carry the incision forward on either side to the next pair of forceps, keeping the incision through sound skin and outside the scar-tissue. Then turn the incision



FIG. 353.—Incision for repair of complete tear of the perineum.

inward and continue it on either side to the last pair of forceps. Now, with round-pointed scissors, separate this area of integument, largely scar-tissue, from the subjacent structures, and continue the dissection up the recto-vaginal septum, separating the posterior vaginal wall from the anterior rectal wall until the rectum drops freely away. Finally, cut away a small Λ -shaped portion of the posterior

vaginal wall, so completing the incision. Do not remove too much vaginal wall as the incision must be closed without tension if healing is to be secured. Repair the anal canal by a series of catgut stitches passed from the rectum through its wall



FIG. 354.—The various kinds of sutures closing the incision for repair of complete tear of perineum.

a, Catgut sutures to be tied inside the anal canal; *b*, catgut sutures to be tied inside the vagina; *c*, catgut sutures to be buried in the wound; *d*, silkworm-gut suture to be tied on the perineal surface.

only into the wound and back into the rectum on the other side, so that the knot is tied in the rectum and not in the wound. The first stitch is placed at the apex of the rectal incision and the others follow it from above downwards until the skin-surface is reached. These stitches are left long until all are inserted. They are

then cut off, their ends projecting at the new anus. A continuous suture is not recommended by the writer for this purpose (see Fig. 354, *a*).

The ends of the *sphincter ani* may or may not be seen. It is not worth while to dissect for them, but the wound must run deeply into firm tissue on both sides of the newly-formed anal canal. A stout silkworm-gut suture is passed from the skin-surface on one side through fascia and muscle and out into the depth of the wound. It is then passed deeply through muscle and fascia on the other side and out on to the skin-surface. This suture may be tied at once, and after it is drawn tight the new anus should grip the little finger. It may well be reinforced by another deep silkworm-gut suture passed in front of it, or behind it, as may be convenient. The vaginal portion of the incision is next sutured with catgut from above downwards, and the sides of the new perineal body are drawn together with buried sutures placed in two layers, care being taken to leave no dead spaces. The operation is finished by completing the suture of the perineal surface with silkworm-gut sutures passed deeply so as to reinforce the buried catgut (see Figs. 352, 354, *a*).

Many operations of this kind give perfect control over the motions of the bowel although they do not secure direct union between the ends of the torn sphincter. In these cases there is a mass of connective tissue in the middle line in front of the anus, and the ends of the sphincter are firmly attached to it. The muscle is not circular but horseshoe-shaped, the gap being filled by connective tissue. This is recognized on inspection by noting that there is a segment of skin in front of the anus which is not thrown into radial folds. When the operation is nicely done, and is successful in bringing about muscle-to-muscle union of the sphincter, the skin-folds radiate from the anus all round it, and form a complete star just as they did before the sphincter was torn at all.

PESSARY-TREATMENT FOR PROLAPSE

The use of pessaries is permissible under three circumstances :

- (1) When operative treatment is refused by the patient.
- (2) When it is contra-indicated by disease or old age.
- (3) When it must be delayed owing to illness, pregnancy, lactation, or social and other reasons.

Very few patients refuse operation when they are definitely promised a cure for the rest of their lives at the cost of three weeks in bed, some slight discomfort, and the risk of the anaesthetic.

In estimating the fitness of a patient for operation, ill-health due to want of

exercise, and thus due to prolapse, must not be confused with disease existing apart from the prolapse. Patients between seventy and eighty years of age often do very well after plastic vaginal operations, though they heal more slowly than younger patients.

This work cannot be done during pregnancy, and should be postponed until five or six months after parturition, or until the child has been weaned. Thus there remains a definite range of utility for pessaries.

When they must be used, rings of solid rubber, or of hollow rubber stiffened by watch-spring, are the most useful. For rectocele and cystocele the addition of a diaphragm improves these instruments. They should be sterilized by boiling, and should not be lubricated with oily or greasy substances as these cause the rubber to perish quickly. These pessaries should be removed for cleaning frequently, and they seldom last for more than three months. In women past the menopause the size of the instrument used should be reduced from time to time, for if this is not done, the shrinking vagina will be exposed to undue pressure by the ring, and ulceration will follow. The ring acts by flattening the vagina and making it rigid instead of plastic. It rests against the pubic arch, being held up against its narrower portion by the perineum. If the perineum is very defective the ring lies too low down opposite the wide portion of the pubic arch. It then tends to come out when the patient strains. Thus many patients cannot wear ring pessaries, and they require cup-and-stem instruments attached by rubber tubing to belts worn round the waist or hips. These instruments are taken out every night, and replaced by the patient in the morning.

Another cleanly device is a ball of rubber with a short tube and tap. In the morning the ball is inserted by the patient in the vagina, and is then inflated with air by means of a small bulb air-pump. At night the ball is deflated, removed from the vagina, and washed.

Many patients with prolapse keep themselves fairly comfortable by wearing constantly perineal pads held in position by T-bandages. This device is more efficient when the vagina is packed with a strip of gauze or lint before the pad and bandage is applied. For securing the healing of ulcerated vaginal walls as a preliminary to operation, the pack, pad, and bandage treatment is invaluable when the patient cannot be kept in bed. It can be carried out by a nurse, by an intelligent relative, or even by the patient herself.

CHRONIC INVERSION OF THE UTERUS

By Professor WALTER C. SWAYNE
(Bristol)

CHRONIC inversion of the uterus is that condition in which the uterus has remained turned inside out, either as the immediate result of a labour some weeks previously, or as the result of pathological conditions unconnected with parturition. It has been suggested that the term 'chronic' should be applied to those cases in which treatment is begun after an interval of thirty days from the date of the original inversion. This division, arbitrary as it seems, corresponds to the period of uterine involution, and therefore should be retained.

Chronic inversion can be described etiologically as occurring under one of two heads (*a*) puerperal, (*b*) pathological. The inversion may be complete or incomplete; in the former the whole uterus including the cervix is inverted, while in the latter condition the cervical portion with, in some cases, part of the body of the uterus may remain in its normal position. The inner surface of the corpus uteri projecting into the vagina forms a rounded hollow tumour of about $1\frac{1}{2}$ inches in diameter covered with mucous membrane. Its cavity, lined with peritoneum, may contain the ovaries and tubes, and communicates directly with that of the peritoneum in the early stages of all cases. In the later stages this communication may be sealed by the agglutination of the peritoneal surfaces. The sac of an inverted uterus does not, in the chronic condition, contain intestine, since if it does so in the early or acute stage complete intestinal obstruction is practically certain to occur and cause death. A case of this character has been reported. The depth of the sac depends on the actual size of the uterus, and may vary from $\frac{1}{4}$ inch to 2 or 3 inches.

Complete, or nearly complete, chronic inversion does not occur with the same frequency in the pathological, as it does in the puerperal, variety. The pathological form is rarely complete; the puerperal variety is generally either complete or nearly so.

Frequency.—Neither variety of chronic inversion is common. The puerperal

variety, being found only in those patients who survive the shock, haemorrhage, and frequent septic infection of the acute form, depends on the frequency of the latter. This is given by various writers as occurring in from 1 in 250,000 cases, as recorded by Carl Braun in Vienna between 1849 and 1878, to a figure as high as that of Kehrer, who states that it occurs as often as 1 in 2000 labours. Jardine discovered 3 cases recorded



FIG. 355.—Incomplete puerperal inversion, the lower third of the uterus not having come down.
(Museum of the University of Bristol.)

A, Inversion ring with Fallopian tubes passing into it; B, inverted fundus.

The history of the case is missing, but it is probable that it is not a case of chronic inversion, as the size of the uterus corresponds with that of a recent parturition. Moreover, no adhesions are to be noticed on the peritoneal surface of the inverted uterus.

in over 50,000 births in the Glasgow Maternity. The writer has met with 2 cases in over 14,000 cases in the Maternity Department of the Bristol Royal Infirmary.

Out of Crampton's¹ 224 cases, all of which were puerperal, 196 occurred immediately after labour, and of these 93 had become chronic when treated, *i.e.* about

¹ Crampton, *Amer. Journ. Obstet.* New York, 1885, vol. xvii. p. 1009.

43 per cent. Of the remaining 28 the time of occurrence varied from one hour to thirteen months, but in 11 only did it occur later than the end of the second hour, after delivery.

It is obvious that these figures leave much to chance, and that it is highly probable that the accident is much more frequent than is shown by recorded cases.



FIG. 356.—Chronic inversion. (Museum of Royal College of Surgeons, No. 4725.)

A, Inversion ring; B, inverted fundus; C, vaginal wall cut open.

The patient died fifteen years after the occurrence of the inversion at the time of her last confinement. Contrast the size of the fundus with that of the previous specimen.

Thorn¹ found 92 cases of chronic inversion out of 521 puerperal inversions collected by him, and Croisie 104 chronic inversions out of 400. The frequency of chronic puerperal inversion is not therefore likely to be great since the cases accessible will

¹ *Sammlung f. klinische Vorträge (Gynäk. No. 229), Leipzig, 1911, No. 625, "Zur Inversio Uteri,"* p. 101.

be limited to those which (1) survive the acute stage, the mortality in which is variously estimated as from 20 to 35 per cent ; (2) remain untreated until the acute

stage is passed owing (a) to failure in diagnosis, and (b) failure in attempts at reduction.

Local Changes.—The pathological results in cases of chronic inversion are those which might be expected from such an obstacle to the circulation in the veins running from the fundus uteri, as that caused by the constricting ring of the cervix. Oedema, swelling, congestion, and haemorrhage are marked features. Ecchymosis and sloughing of the mucous membrane are common, especially in cases in which slight septic infection has occurred in the earlier stages. Localized patches of deeper ulceration, and even massive sloughing resulting in spontaneous amputation, have occurred. In fact, in puerperal cases sepsis is not only responsible for a large proportion of the deaths occurring among those patients who survive the initial shock and haemorrhage of the acute stage, but owing to the tissue-changes it produces, it increases the difficulties of treatment.



FIG. 357.—Chronic inversion of the uterus produced by a fibroid polypus. (Museum of the Bristol Royal Infirmary.)

A, Lower limit of inverted fundus; B, polypus cut into and opened out; C, urethra; D, vagina.

The polypus has been cut into and shows a cavity (artificial). The shallow groove marks the point of attachment of the polypus to the uterine wall.

As involution proceeds the mass becomes smaller, and the depression, at the bottom of which lies the peritoneal covering of the fundus and the uterine cornua, becomes shallower; but the peritoneal surfaces may become adherent and thus introduce a factor which profoundly modifies the technique of treatment. There is no doubt that the failure

of attempts at reposition, either manual or instrumental, is frequently due to peritoneal adhesions within the inversion sac.

The uterus may eventually shrink until its normal size is nearly reached, but more commonly it remains enlarged and fibrotic, while the mucous membrane may take on the characteristic appearance of squamous epithelium.

Etiology.—In dealing with chronic inversion the manner in which the displacement occurs is not of first-class importance. It has been described as being either fundal, in which the fundus uteri descends first; lateral, a part of the sides of the corpus uteri being the leading portion; or cervical, in which the cervix becomes gradually rolled outwards. The first two may be either puerperal or pathological. The third is nearly always of puerperal origin, although one case at least has been reported in which the puerperal factor was absent, and no obvious pathological cause was found.

Puerperal Inversion.—Acute inversion occurs most frequently in primiparae, and consequently chronic inversion of puerperal origin is found most frequently after the first labour. Multiparae are by no means exempt; of two cases which occurred in a series of 14,000 labours in the extern maternity of the Bristol Royal Infirmary, both the patients were multiparae. The pathological variety, however, has no definite relation to partity. One of the writer's cases of this form occurred in a nullipara.

In either the fundal or lateral variety the first step is that a portion of the uterine wall, usually the placental site, becomes pressed into the uterine cavity, and having reached a certain depth, is grasped by the remainder of the uterus which contracts upon and eventually extrudes it completely through the cervix, progressive invagination occurring. In order to allow of this it is essential that there should be inertia of the depressed portion with irregular contraction of the remainder of the uterine wall.

Cervical inversion is described as being a gradual inversion of the cervix with descent of the lower uterine segment. Want of contractility in the cervix must be present in order to allow of the occurrence of this variety, and in addition, the changes in the uterine wall described by Reeve, leading to its becoming soft and flabby. In a case reported by Taylor,¹ the occurrence of this variety in a nullipara is proved to be a possibility. The hymen was intact and there had been no possibility of pregnancy.

The inversion may be spontaneous, *i.e.* occurring without the presence of a definite pathological cause, such as a polypus or other new growth, and, apart from such influences as delivery of the placenta, traction on the cord by the foetus,

¹ J. W. Taylor, *Journ. Obst. and Gynaec. Brit. Emp.*, 1902, vol. vii. p. 121.

or violent uterine expulsive action at the end of the second stage. Increased abdominal pressure during the puerperal period is the usual cause.

This method of production, apart from the puerperal state and pathological causes, would seem to be almost impossible, but certain reported cases leave no doubt it has occurred.

In a case which occurred in a patient who was admitted to the Bristol Royal Infirmary on 8th November 1885, the following was the history :

The patient was a multipara aged 38 ; eleven children, last confinement occurred four years previously ; no miscarriage. She was admitted on account of ' something coming down.' A ' tumour ' was felt in the vagina about 4 inches in length with a soft velvety surface, bleeding very freely on contact. The upper part was encircled by the vaginal portion of the cervix. On the day after admission the encircling ring caused by the external os had disappeared, while the tumour had increased in length to 6 inches. The tumour was removed two days later by the *écraseur*, and the patient died eight days afterwards from septic peritonitis. The ovaries were not in the inversion sac.¹ The case was evidently one of spontaneous inversion which was not complete when the patient was first admitted to hospital, but became so on the following day.

In the majority of cases of puerperal origin the inversion commences at the placental site, and is due to efforts to extract the placenta, either by pulling on the cord, by the improper application of Crède's method of expression, or by the traction caused by the weight of the foetus on a cord either short or coiled round the neck.

About 38 per cent of the cases collected by Lee² resulted from traction on the cord, and about 6 per cent from attempts to remove the placenta by other means. In 66 per cent the placenta was adherent, and in half of this number it was removed after the inversion had occurred. In 9 per cent the cord was short or coiled round the neck. The labour was precipitate in a certain small number, the inversion occurring almost at the same time as the delivery of the child. In 78 per cent one or other of these factors was present. In 13 per cent the process was not the result of interference, but apparently natural, the placenta being delivered spontaneously. These figures, although not absolute proof, all indicate the placental site as the important point in the commencement of puerperal inversion. There must be present a condition of the placental site admitting of its inversion, and in addition irregular action of the uterine wall surrounding it.

It seems hardly necessary to enlarge upon the various factors which may operate,

¹ Unfortunately the specimen has disappeared.

² Lee, *Amer. Journ. Obstet.* New York, 1888, vol. xxi. pp. 616-666.

either in conjunction with those mentioned or separately, in the production of puerperal inversion. Increase of intra-abdominal pressure by whatever cause produced; distension and increase in size of the uterus itself, large size of the placenta, delivery in the erect posture, may all assist, but the importance of the puerperal state in its bearing on chronic inversion lies not so much in the mode of production, as in the introduction of two factors, one that of septic infection, and the other that of the degenerative changes which accompany the process of involution. The latter are to some extent the result of the former, since chronic or sub-acute sepsis is particularly likely to lead to changes of a fatty or fibrous nature, more especially when it occurs in an organ already rendered oedematous by partial strangulation.

Pathological Inversion.—Inversion of the pathological variety has but rarely any connection with the puerperal state, since its proximate causes are, as a rule, unfavourable to the occurrence of pregnancy. It is commonest in association with fibromyomata, especially if polypoid, and sometimes occurs when the tumour is submucous.¹ In fact, in all cases of fibroid polypus, if some degree of inversion is not present in the first instance, this displacement is very frequently produced when the tumour is subjected to traction in the process of removal. Hence the accident of the removal of a piece of the uterine wall along with the tumour was by no means infrequent in the days when the use of the *écraseur* was the method of election for the removal of fibroid polypi, and in addition the peritoneal cavity was often opened with most unfortunate results.

The recognition of this possibility, and the removal of the tumour by enucleation after opening its capsule, have, however, rendered this accident less common in modern times, while modern aseptic technique has reduced the danger to a minimum in those cases in which, in spite of all precautions, such an accident takes place.

In all cases in which the inversion is caused by a polypus, the removal of the tumour should be the first step towards the correction of the displacement. This proceeding must be undertaken with great caution, especially if the tumour should happen to be a fibromyoma of the submucous variety, or polypoid with a broad base. The mucous membrane and the capsule of the tumour should be incised, and the latter should be carefully dissected out with a blunt instrument aided by snipping with a pair of scissors.

Generally in these cases the reposition will be comparatively easy when once the tumour has been removed, since the sufferers from this type of the affection have usually had considerable warning in the shape of previous haemorrhages, and the added pain and dragging are pretty certain to cause them to seek medical advice as

¹ See also Figure 95, p. 203.

soon as the inversion has occurred. There is, therefore, less chance of adhesions being present, and degenerative changes, the result of circulatory interference extending over a long period, have not had time to arise. Taxis is therefore more likely to be successful in pathological cases than in those of puerperal inversion, in which latter a considerable period has elapsed since the occurrence of the acute stage.

Pathological inversion due to causes other than innocent tumours is uncommon.

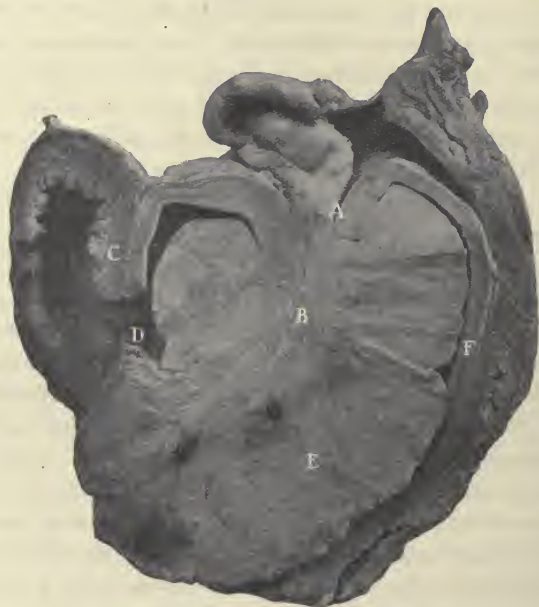


FIG. 358.—Incomplete inversion due to sarcoma.

A, Inversion ring; B, inverted fundus; C, wall of bladder; D, vesico-vaginal fistula; E, sarcomatous growth; F, posterior vaginal wall.

Sarcoma is said to be its most frequent cause, and the diffuse variety more so than the localized. The growth may be either spindle- or mixed-celled.

In a case which occurred in the Bristol Royal Infirmary, the patient, an unmarried nullipara of nineteen, was admitted to hospital on account of irregular haemorrhage, which led to her physician discovering a rounded placenta-like mass in the vagina. She also suffered from incontinence of urine. The placenta-like mass was friable with solid tissue beneath the friable mass. Examination under anaesthesia showed that the mass consisted of the inverted fundus. A large quantity of the friable tissue was removed by the curette, and on microscopic examination

was discovered to consist of spindle-celled sarcoma. The incontinence of urine was due to a large vesico-vaginal fistula. No ring representing the cervix could be felt on recto-abdominal examination, and the whole tumour was immovable so far as any attempts to push it upward went. During the process of removal of the growth the peritoneal covering was perforated in one spot, but without ill result. The patient's condition precluded any attempt at removal of the uterus by vaginal hysterectomy, while the extensive nature of the growth gave little hope of doing so with ultimate success. The fistula also introduced a disturbing factor, as its thickened edges seemed to be infiltrated with growth. The patient succumbed within a few weeks, and at the *post-mortem* examination the walls of the inverted uterus were found to have become completely fused. The inversion was not complete, a small portion of the supravaginal cervix not having descended.

Howard Kelly¹ has described a similar case. He, however, was able to reduce the inversion, but microscopical examination of the friable tissue removed by the fingers in the process of reduction showed it to be composed of spindle-celled sarcoma. A vaginal hysterectomy resulted in uninterrupted recovery, and the patient survived without recurrence for many years.

Carcinoma, as the causative factor in pathological chronic inversion, is less common than sarcoma, but two cases are recorded by Thorn.² Endothelioma has also been found in two cases reported by Stark.³ In all cases in which the inversion is associated with malignant disease, removal of the uterus and appendages should be performed as early as possible after the discovery of the true pathological cause of the condition.

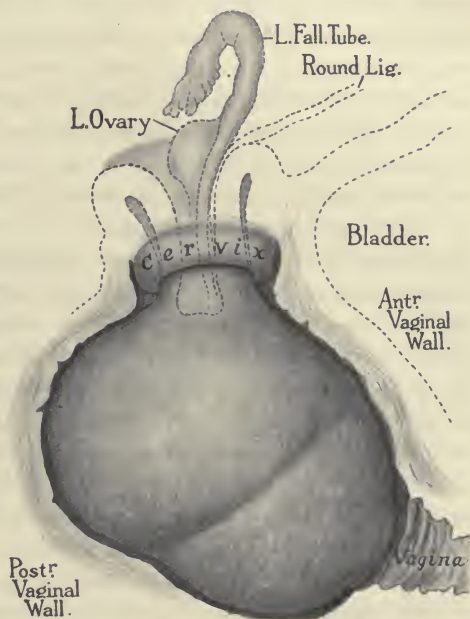


FIG. 359.—Pathological inversion due to sarcoma.
(Howard Kelly.)

¹ Howard Kelly, *Operative Gynaecology*, vol. i. p. 644.

² W. Thorn, "Zur Inversio Uteri," *Samml. klin. Vortr.* Leipzig, 1911, No. 625 (*Gynäk.* No. 229), p. 101.

³ Stark, *Journ. of Obst. and Gynaec.*, 1913, vol. xxiv. p. 68.

Diagnosis.—In cases of the puerperal variety of chronic inversion there will be, as a rule, little difficulty in diagnosis. The immediate symptoms of acute inversion, which is the invariable forerunner of the puerperal variety, are of such gravity that failure to recognize the inversion in its acute stage is extremely unlikely. When, however, the inversion occurs during the later part of the puerperium, and especially if it should do so in association with the presence of a fibroid in the uterine wall near the fundus, it is quite possible that the inversion might be taken for the extrusion of the fibroid from the puerperal uterus. In such a case the fibroid is probably the proximate cause of the displacement, so that the inversion, although occurring within the puerperal period, is practically of the pathological variety. It is the case, however, that acute inversion has been often overlooked, and the displacement only discovered after an interval during which the patient has recovered from the accompanying shock and haemorrhage.

The tumour *occupying the vagina* is covered with velvety mucous membrane, bleeds easily, and often spontaneously, and the orifices of the Fallopian tube can be found in most cases after a careful search. This is not invariably possible, as the writer can say from personal experience. On bi-manual examination the fundus will be found to be absent from its normal position, and if the cup-like depression at the neck of the inversion cannot be felt through the abdominal wall, it is possible to make it out on rectal examination, if the tumour in the vagina is pulled down so as to bring the upper part within reach of the examining finger. The sound cannot be passed into the uterus. If the ring of the vaginal portion of the cervix can be felt, the sound can be passed for a short distance, but not to its normal length. If the inversion is complete the sound cannot be passed out of the vagina at all. Both bladder and rectum must be empty to allow of complete examination.

If it should so happen that a fibroid occupies the uterine wall and refuses to pass into the inversion funnel, it may be mistaken for the fundus and give rise to an error in diagnosis; but as no case of this kind has to the knowledge of the writer been actually observed, the condition though possible must be looked upon as hypothetical. In any case in which, during the puerperal period, a fibroid is extruded, inversion either partial or complete is more than likely to occur, and this possibility should always be borne in mind.

In spontaneous non-puerperal inversion the rarity of the condition is likely to lead to a mistake in diagnosis, especially if, as in the case quoted from the records of the Bristol Royal Infirmary, the inversion is only partial when first seen. A very thorough examination under anaesthesia should be made before any definite diagnosis is made or operative procedure decided on.

In pathological inversion the same care is necessary. In the case of inversion with diffuse sarcoma, previously quoted, the tumour in the vagina had, before admission, been diagnosed as placenta, which it resembled very closely. In pathological inversion due to a fibroid a mistake in diagnosis is also possible, especially if only partial. In one case known to the writer, operation by *écraseur* resulted in the removal of a portion of the fundus and the opening of the peritoneal cavity, owing to the failure to recognize that what was supposed to be a broad pedicle was in reality the inverted fundus. The patient, however, made a good recovery.

The *differential* diagnosis can be made in these cases by noting the contrast in texture of that part of the mucous membrane covering the fibroid, and that covering the uterine wall; the former is smooth, thin, and atrophic, the latter velvety and thick. A fibroid has no openings; the inverted fundus shows the openings of the tubes. The sound, unless the fibroid has caused some inversion, will pass to the full length or in some cases to more than its normal length. If the fibroid is not polypoid but sessile and submucous, the mucous membrane may be velvety and thick, but irregular consistence of the tumour should prevent a mistake. In any case, examination under anaesthesia should reveal the cup-like depression of the opening of the inversion-funnel. In the case of procidentia the opening of the os and the depth to which the sound passes should prevent any mistake, while the fundus will be felt on bi-manual examination. Bi-manual examination is more satisfactory than the passage of the sound, as in some cases of fibroids, especially those in which there is a polypus associated with fibroids of the body of the uterus, the uterine canal is tortuous and the passage of the sound a difficult manœuvre. In any case when a fibroid is present the difficulty of diagnosis of a partial inversion should be remembered and the fibroid enucleated, or, if its pedicle is divided, this should be done close to the tumour.

Prognosis.—Puerperal chronic inversion is found only in those cases in which the patient has survived the shock, haemorrhage, and risk of septic infection of the acute condition, and except for persistence of sepsis, she is out of immediate danger. The mortality rate, therefore, is not high, and the patients may survive, though nearly always in a state of impaired health, for many years. One patient under the care of the writer, who refused operative treatment after the failure of manual taxis and the use of repositors, lived for fourteen years and died of a malady unconnected with the inversion. She suffered from severe menorrhagia, and owing to the constantly recurring haemorrhages and dragging pain, was practically a bed-ridden invalid for the whole period. The great majority of patients who suffer from

either puerperal or pathological chronic inversion live in spite of the displacement, provided, if pathological, that the cause is not malignant.

In 83 cases of chronic inversion collected by Thorn,¹ which included 4 in which the tumour causing the displacement was malignant, 7 died; and in 104 cases collected by Croisie,² 7 died. Of the deaths recorded by Thorn one was caused by haemorrhage and the remainder by cachexia and infection. The death-rate is consequently much less than that of the acute condition.

Although the mortality in chronic inversion is not very high, the patients are nearly always rendered chronic invalids by recurrent haemorrhage, pain, and infection, and are the subjects of constant risk to life. Treatment should be adopted with these facts in mind, and should be such as will not increase risks already present.

Treatment.—The treatment of chronic inversion of the uterus may be divided into two sections, the first including those methods which do not, and the second all those methods which do, involve cutting operations. Those included in the second section may again be subdivided into the methods which are conservative in nature, *i.e.* which aim at leaving the uterus in such a condition that it is capable of performing its functions, and those methods which involve the removal of either the whole or part of the organ itself.

A. Non-Operative Treatment.—The methods employed in the first section include those which depend on posture, and either manual taxis or the use of different varieties of mechanical repositors. Before proceeding to describe these, a brief general outline of the preparatory details is necessary.

The patient should be kept in bed with the foot of the bed raised; the bowels and bladder regulated, and the surface of the inverted uterus cleansed as far as possible by douching with an antiseptic solution of a non-poisonous character. Oedema and swelling can be reduced by the use of glycerine tampons impregnated with an antiseptic, and the general condition of the patient should be improved as much as possible. Haemorrhage must be treated efficiently. If the attempt at reposition is made successfully after a proper interval for treatment especially directed to the removal of any chronic septic infection, nothing more is needed, except to treat any slight constitutional disturbance that may be the result of the reposition. If the attempt at reposition is unsuccessful, renewed attempts should not be made except after a considerable interval during which the same local treatment should be applied as before.

Treatment by taxis and postural methods, which latter aim at elevation of the

¹ *Sammlung klin. Vortr.*, Leipzig, 1911, No. 625 (*Gynäk.* No. 229), p. 101.

² Quoted by Murphy and Lynch, *Am. Prac. Surg.*, 1911, vol. iii, p. 150.

³ *Sammlung klin. Vortr.*, Leipzig, 1911, No. 625 (*Gynäk.* No. 229), p. 101.

hips and lower extremities and the lowering of the head, are all of great antiquity ; the manual method of reposition aided by elevation of the hips was first recommended by Hippocrates. While in the present day these methods are to be considered to a certain extent subsidiary to operative treatment, they should be tried in all cases, provided that the attempts at reposition are not too violent, nor persisted in over too long a period of time. Failure is the result of manual taxis in a very large proportion of cases of chronic inversion, on account of inability to dilate the cervical contraction ring, adhesion of the peritoneal surfaces of the inverted uterus or rigidity of its walls due to fibrous degeneration. Success can only be obtained in those cases in which adhesions are absent, when the contraction ring formed by the cervix can be dilated, and the uterus is sufficiently elastic to allow of its indentation.

Manual reposition, moreover, is not a method altogether devoid of danger. Accidents such as laceration of the vagina or perforation of the uterine wall by the finger have occurred, which is not surprising when it is considered that the enlarged uterus has, in a large proportion of cases, undergone degenerative changes. The manipulation of the enlarged uterus is, in itself, a proceeding not devoid of risk, quite apart from the dangers of laceration or perforation. The mucous membrane is in a state of marked congestion, and is nearly always the seat of more or less septic infection.

It has been noted that in quite a large proportion of cases where manual reposition has succeeded, success was followed by a rise of pulse and temperature, indicative of considerable constitutional disturbance. This is probably produced partly by the disturbance of toxins and their passage into the general circulation, and partly by the absorption of various physiological products, poured into the blood as the result of the alterations in the circulation of the organ.

Manual taxis, when used, should be as gentle as is compatible with the production of the desired result, and in any case should not be used continuously for a long period, as damage to the tissues of the uterus will most certainly be done if undue force or too prolonged efforts are made.

The foregoing remarks apply also to the treatment by various forms of mechanical repositors. When the latter are used the pressure applied by their means is continuous and usually prolonged, and is especially liable to produce ill results in cases in which immediate success is not obtained. This prejudices the recovery of the patient firstly by the actual damage done to the tissues and secondly by delaying the operative measures, which will ultimately be necessary.

Taxis.—Any attempt at manual taxis should be made under complete surgical

anaesthesia, another reason for avoiding too prolonged use of this method. Manual taxis, if used with due precaution, *i.e.* without unnecessary violence and over a period of time not too prolonged, is, when successful, the best method of treatment, except in those cases where there is definite evidence of the presence of septic infection of the inverted organ. The shorter the time that has elapsed since the acute stage, the more likely is manual taxis to be successful. If, however, as before mentioned, marked septic infection is present, operative measures of a more drastic nature will be better, as the manipulation of an infected uterus, even if the infection is not severe, is in itself a dangerous proceeding.

Manual taxis may be made use of in several ways. Pressure may be applied *centrally*. In this method the most prominent portion of the tumour is pushed in upon itself until the organ returns to its normal position. This method involves the passage of two thicknesses of the uterine wall through the constricting ring formed by the cervix, a difficulty which is likely to lead to failure, since the bulk of the tumour which has to pass through the constricting ring is materially increased. The pressure may also be applied laterally, an attempt being made to push up one cornu of the inverted fundus at a time. This plan was first suggested by Noeggerath. The method is open to the same objection as that which applies to the method of central pressure, that a double thickness of the uterine wall has to be passed through the constricting ring.

The best method, without question, is that in which *peripheral* taxis, as suggested by Emmet, is used. Here the pressure is made on that part of the inverted fundus which came down last, *i.e.* the part which is in immediate propinquity to the constricting ring of the cervix. In this method a certain amount of manipulation and squeezing of the inverted fundus is done which reduces the swelling caused by oedema. The fingers of the hand which encircles the fundus should then be passed through the cervix and pressed on the portion of the uterus just above the cervix which has not yet descended, at the same time stretching open the constricting ring. This will shortly be felt to yield, and the inverted portion to pass slowly upwards, and presently, as the pressure is maintained and the cervix stretched open by the fingers, the whole fundus will pass through it and undergo reposition.

This method is not open to the objections mentioned in dealing with the first two. The amount of tissue which has to pass through the constricting ring of the cervix is not increased by the manipulative measures, and the resistance of the parts pressed upon is less than when the other methods are used. The objections to it are, first, that if the uterus is very bulky it will be found difficult to encircle it completely and properly with the hand, and secondly, the space available for manipulation is very

much diminished by the size of the tumour, thus adding very materially to the difficulties. While taxis is being performed the fundus should be pressed backwards and the cervical portion upwards, so as to bring it as much as possible into contact with the abdominal wall, which should be depressed by the fingers of the free hand in an attempt to dilate the constricting ring from above. An attempt at dilatation of the ring may be made by pressure applied by other routes. For example, it has been recommended that the constricting ring should be dilated by means of the finger or fingers of the free hand passed through the rectum, the fundus in this case being pulled forwards and upwards so as to bring the constricting ring as near as possible to the anus. It has also been suggested that this should be done by passing the finger into the bladder, the fundus in this case being directed posteriorly.

Either of these procedures may be successful, but the two last are not to be recommended because, owing to the pressure necessary, considerable damage may be done in the first place to the wall of the rectum, which might quite conceivably be torn, and in the second either to the wall of the bladder, which may be lacerated in the same way, or to the urethra, which is also liable to laceration from the amount of dilatation necessary to admit the finger.

In any case where taxis is successful, it must be borne in mind that there is a possibility that the inversion may recur. To prevent this, the uterus should be packed with sterile gauze.

Great care is necessary in dealing with pathological inversion. In twelve cases out of eighty-three collected by Thorn,¹ the uterus was torn and the peritoneum opened. This accident can be avoided without difficulty if a fibromyoma is the cause, by opening the capsule and enucleating the tumour by careful dissection. If the inversion is due to malignant disease, especially sarcoma, as in the writer's case above described, the greatest care must be taken, as the absence of a definite capsule and the blending of the growth with the uterine tissue make its delimitation a matter of great difficulty.

If it is suspected that the growth or tumour is malignant, a lengthy operation with a view to its removal, but leaving the uterus, is not advisable. Sufficient should be removed to facilitate manipulation, and the portion removed submitted to microscopic examination. There is no particular advantage in attempting to reduce the inversion in a suspected case unless the microscopic examination proves that it is innocent. If the examination shows that malignant disease is present, the uterus and appendages should be removed as soon as possible.

If manipulative efforts at reduction are unsuccessful, as is frequently the case,

¹ W. Thorn, "Zur Inversio Uteri," *Samml. klin. Vortr.*, Leipzig, 1911, No. 625 (*Gynäk. No. 229*), p. 101.

the choice of treatment lies between the use of mechanical appliances, such as the various forms of repositors and pessaries, and various cutting operations.

Repositors.—The use of repositors has been successful in many cases and many ingenious instruments have been devised. All those which are most likely to be effective have the great disadvantage of involving continuous pressure on the oedematous and engorged inverted organ applied through the medium of an unyielding substance. The pressure, to be efficacious, must be applied for a considerable space of time, and consequently damage to the organ, which is already in a state of malnutrition, is extremely likely to occur. The constant pressure of an instrument is far more likely to produce dangerous results than the intelligent and sensitive pressure applied by the hand. The obstacles to reduction in the cases in which repositors are used are practically the same as those which prevent the successful performance of manual taxis. Adhesions between the peritoneal surfaces, and the rigidity of the constricting ring of the cervix, will prevent success in a large number of long-standing cases.

If repositors¹ are used their shape is of some importance. The 'cup and stem' form is not recommended owing to the liability of the cup, if reposition is successfully accomplished, to pass into the cavity of the uterus and be retained there. This accident has occurred on more than one occasion. The best form is that in which pressure is produced by a cup which is formed at the end of a short cylinder of the same diameter as the cupped end, as in Aveling's repositor. Some repositors have been devised in the shape of rubber bags capable of being distended with water, and others in which the pressure is maintained by distension with air. These are not open to the same objections as regards their pressure effects, but their efficacy is limited if it is wished to obtain success without delay.

In repositors of the type invented by Aveling, the pressure is maintained by the use of four elastic straps attached to the end of a curved rod on which a cup is mounted. These are carried upwards and attached to a waist-belt or a shoulder-girdle, so that the amount of pressure may be graduated as required. The stem on which the cup is mounted should have a double sigmoid curve of such a shape as to bring the line of application of the pressure at right angles to the plane of the pelvic inlet.

In one form (White's repositor) the stem of the repositor terminates in a spiral spring, which can be pressed upon by the operator either with the free hand or by the chest, thus allowing for the use of one or both hands in the manipulation of the tumour through the vagina and at the same time through the abdominal wall. The

¹ These are not illustrated as the various forms can be found in any instrument-maker's catalogue.

latter instrument necessitates the use of a general anaesthetic, as the process is extremely painful. Repositors of the Aveling type do not require a general anaesthetic, but as they produce considerable pain the use of an analgesic, such as morphia, while the process of reduction is going on, is necessary.

The invention of Aveling's repositor led to the hope that a method, invariably safe and invariably successful, had at last been found for dealing with chronic inversion. This, however, was not the case. The use of repositors is neither devoid of danger nor invariably successful any more than manual taxis. The factors which militate against success in the case of attempts at either manual or instrumental reposition cannot be too strongly emphasized. Quite apart from want of dexterity or power on the part of the operator, peritoneal adhesions, the pressure of the constricting ring of the cervix, and most important of all, in cases of long standing, a rigid and fibrotic uterine wall will all assist in producing a state of things which will result in the failure of the most intelligent and dexterous attempts at reposition. Every gynaecologist knows the extent to which even the lightest adhesion will prevent the success of indirect manipulative measures; how, for example, quite slight adhesions will prevent the reduction of a retroversion, or the freeing of an adherent ovary; also how difficult it is to dilate the cervix uteri in some cases when this part of the organ has been the seat of chronic inflammatory changes. When, in addition to these factors, it is remembered that the uterus, partly from circulatory changes and partly from slight chronic septic infection, has become fibrotic and rigid, its elasticity lost and its walls thickened, it will be obvious that while failure is certain to result in a large number of cases, many of the successes will be obtained only at the expense of great trouble and anxiety to the operator, much pain to the patient, and considerable risk from pressure on tissues, the vitality of which is already impaired.

In view of all these considerations, too much reliance should not be placed on the so-called 'safe' methods, but the operator must be prepared to go further and deal with the case by one or other of the cutting operations hereafter described.

If the decision is to proceed to operative measures instead of repeating the attempts at reposition, operation should never be attempted without an interval for preparatory treatment, unless urgently called for by signs of sepsis; in this case the removal of the infected organ will be the preferable procedure. Conservative measures should not be undertaken without careful previous preparation.

B. Operative Measures.—The advantages of the cutting operations are (1) that they reduce manipulation to a minimum, (2) that adhesions can be directly dealt with and the constricting ring dilated, and (3) that the rigid wall of the uterus can

be attacked in such a manner as to make its reposition easy and certain. No danger of lacerating or bruising the tissues of either the uterus or neighbouring organs need be incurred. The most successful and least dangerous operations, however, require considerable experience in gynaecological manipulative work, and those involving the use of the vaginal route should not be undertaken except by an expert.

The different operations vary in detail. The object of the majority of them is to remove the obstruction caused by the constricting ring of the cervix, access to



FIG. 360.—Remains of uterus after amputation of inverted fundus by *écraseur*.

(Museum of Royal College of Surgeons, No. 4727.)

A, Site of obliterated inversion-funnel; B, right ovary; C, remains of stump of fundus with probe in canal; D, round ligaments.

which is obtained by either the vaginal or the abdominal route. Operations by the vaginal route include multiple incisions into the cervical tissues, stopping short of the peritoneum; incisions of the anterior or posterior wall, followed by the dilatation of the constricting ring by means of a dilator or the finger passed through the opening made by the incision; the incision of the cervix after either posterior or anterior colpotomy; and finally, the complete amputation, by the vaginal route, of the inverted organ.

Amputation of the inverted portion of the uterus was first suggested by Themison about the year 50 B.C. It was actually practised successfully by Soranus

in or about A.D. 200, and until comparatively recent years remained the usual operative treatment for cases in which milder measures failed. The operation was carried out by means of the ligature or *écraseur*. In recent times vaginal hysterectomy has been advocated, and rightly so, in cases occurring in women beyond the child-bearing age.

One notable objection to the different methods of amputation of the inverted portion either by means of the *écraseur*, by ligature, or by the formation of flaps from the inverted cervical portion, is that the cut edges are liable to become everted spontaneously, and as a consequence may lead to the death of the patient from haemorrhage which the operator is unable to control owing to the inaccessible situation of the bleeding points. If such an operation is decided on, the operator should pass two or more small sutures of stout silk through the cut edges so that traction can be kept up and their eversion rendered impossible until the haemorrhage has been provisionally efficiently checked. The flaps should be cut in such a manner that the peritoneal surfaces are definitely longer than those covered by the mucous membrane, that is, the flaps must be cut from above downwards and well sloped from the mucous to the peritoneal surface so as to allow of the suturing of the peritoneal and muscular edges, before any attempt is made at eversion.

The peritoneal edges should be sutured separately and then the muscular portion united with stout catgut sutures either continuous or interrupted. In any case considerable strain is likely to be produced by the eversion, and consequently this method is one not to be recommended, since the dangers of the sutures cutting out and of haemorrhage occurring are by no means remote.

The operation of vaginal hysterectomy is not open to the objections that have been mentioned above. Haemorrhage can be prevented with absolute certainty; the operation is not difficult except in so far as the operator's manipulative movements are hampered by the presence in the vagina of the bulky inverted uterus. This factor can be removed by the preliminary amputation of the inverted uterine body. Chronic inversion in women beyond the age of child-bearing, when treatment by manual taxis has proved unsuccessful, may be treated by vaginal hysterectomy, but in young women this operation should be restricted to those cases in which a marked degree of chronic septic infection is present. A large proportion of the fatalities which have occurred after conservative operations has been due to septic infection, occurring as the result either of soiling of the peritoneum or of a progressive systemic infection, the primary seat of which was the inverted uterus. In the latter class of case the removal of the inverted organ by vaginal hysterectomy would obviate the danger. In elderly women, the removal of a useless organ by a procedure which is not in itself particularly dangerous is obviously preferable to

attempts at conservation, which, while not leading to any practical result from a functional point of view, are, on the whole, more liable to be attended with risk than the simpler procedures of either complete or partial removal. In young women, however, unless there is a marked degree of septic infection, conservative measures should be the procedure of election.

The advocacy of conservative operative measures is of comparatively recent date. In 1858 Aran advocated the incision of the contraction ring of the cervix, and this operation was successfully practised by Marion Sims at a later date. Robert Barnes,¹ in 1861, dealt with an obstinate inversion by dragging down the inverted uterus by means of a loop of soft tape and then making multiple radial incisions passing through the tissues of the cervix but not through the peritoneum. It had been previously noted that the reduction of the inversion was nearly always attended by laceration of the cervical ring in cases where manual taxis was successful. In 1869 Thomas² dilated the constricted cervix by means of an instrument passed through an abdominal incision, and although this method met with a fair measure of success, the friability of the tissues, the force necessarily employed in the dilatation, and the imperfect measures taken to prevent infection of the peritoneum, resulted in a high rate of mortality.

Malins³ attempted to reduce a chronic inversion by stretching the cervical ring through an abdominal incision and then passing through the fundus into the vagina a stout silk ligature, to the lower end of which a large button was attached. The ligature being pulled on the button made pressure on the inverted fundus.

In 1901 Haultain⁴ incised the posterior portion of the constricting ring through an abdominal incision, sewing up the incision in the uterus after reposition.

Dobbin⁵ in 1905 incised the anterior portion of the ring through an abdominal incision, sewing up the uterine wound after reposition. The patient, however, was already septic and death ensued.

In 1899 Everke⁶ incised the constricting ring through its peritoneal surface after a laparotomy incision.

Stark,⁷ in a case reported in 1913, incised the posterior ring after laparotomy.

In 1893 Browne⁸ incised the posterior wall of the uterus by the vaginal route,

¹ R. Barnes, *Diseases of Women*, p. 168.

² Thomas, *Diseases of Women*, 1872, p. 434.

³ Malins, *Lancet*, 1885, vol. ii. p. 807.

⁴ Haultain, "Abdominal Hysterectomy for Chronic Inversion of Uterus," *Proc. Royal Soc. Med. (Obstet. and Gyn. Sect.)*, 1907.

⁵ Dobbin, *Kelly's Oper. Gynaec.* pp. 642-643.

⁶ *Monatsschrift f. Geburts. u. Gynäk.*, 1899, vol. ix. p. 89.

⁷ Stark, *Journ. Obst. and Gynaec. British Empire*, 1913, vol. xxiv. p. 68.

⁸ Browne, *Journ. Amer. Gynaec. Soc.*, 1899, vol. xxiv. p. 242.

and through the opening thus made, passed a dilator through the constricted cervix. The replacement of the inversion was successfully carried out after suture of the incision.

In 1893 Küstner¹ performed a posterior colpotomy, introduced the finger through the incision, then dilated the constricting ring and broke down adhesions; the reposition of the fundus, after incising part of the posterior uterine wall as far as the cervical canal, was then effected without difficulty.

Piccoli² in 1894 suggested an incision of the posterior wall extending upwards through the posterior half of the external os, and in 1896 Morisani³ practised this method with success.

Spinelli⁴ in 1899 suggested an incision passing through the anterior half of the ring after anterior colpotomy.

Relative Advantages of these different Methods.—The method of multiple incisions as suggested by Aran, Barnes, and Sims is not difficult, and is moderately successful. It is open to the objection, however, that it is practically impossible to close the incisions by suture after reinversion has taken place. The method of Browne by the dilatation of the cervix through an incision in the posterior wall of the uterus would seem to be one to be avoided; it is difficult to understand how it would be possible to coapt the edges of the incision after reinversion, and suture before reinversion is likely to give way. The method used by Browne, Thomas, and Malins of forcible dilatation of the constricting ring, is open to the serious objection that bruising is a necessary result, and that owing to the friability of the tissues, much more damage is likely to be done than can be noted by the operator.

The methods by incision of the inversion ring have the great advantage that they do not produce bruising, and are in nearly all cases immediately effective. But they are certainly preferable to those which depend on dilatation, on account of the certainty of success being obtained, and the avoidance of bruising and possible laceration. The objection that suture is required is not worth considering.

If the incision is made after laparotomy the operation is easier to perform, since the whole of the procedure can be carried out under the guidance of the eyes, and with the whole of the field of operation in clear view. Shock is likely to be marked, especially as the patients are often much debilitated, and contamination of the peritoneum may be difficult to avoid; efficient drainage will materially lessen the last objection. Dilatation is more likely to produce shock than incision.

¹ Küstner, *Zentralblatt f. Gynäk.*, 1893, vol. xvii. p. 945.

² Piccoli, *Arch. di Ost. e Ginec.*, 1898, p. 136.

³ Morisani, *Atti di v. Acad. Med. Chir. di Napoli*, 1897, p. 412.

⁴ Spinelli, *Arch. ital. di Ginec.*, 1899–1902.

Operations by the vaginal route, however, should be preferred by gynaecologists. The manipulative procedures involved are not difficult to those trained in modern gynaecological methods; sufficient drainage can always be secured, and any chance of contaminating the peritoneum is reduced to a minimum. Vaginal operations, as a class, moreover, produce far less shock than those involving the incision of the abdominal wall, since the exposure and handling of the peritoneum are very much less.

Operations by the vaginal route may be carried out either through the anterior or posterior cul-de-sac. The incision of the constricting ring through the posterior cul-de-sac is in itself distinctly easier, and, so long as the incision is kept in or near the median line, there is little chance of other important structures being unintentionally wounded. Its subsequent suture, however, is rather more difficult. The route through the anterior fornix presents many advantages. If more room is wanted it can easily be obtained by the use of Schuchardt's paravaginal section. This procedure may also be used advantageously in cases where the posterior route is adopted. Access to the cervical ring through the anterior fornix is more direct, and the subsequent suture of the incision is much simpler by the anterior than by the posterior route, although the contiguity of the bladder and the possibility of wounding this organ add in some degree to the anxieties of the operation.

Taking all these effects into consideration, we may postulate:

1. That in the absence of septic infection in young women conservative operative measures should always be adopted.
2. That the vaginal is to be preferred to the abdominal route as the method of access.
3. That the route through the anterior is, on the whole, to be preferred to that through the posterior fornix.
4. That in either case Schuchardt's incision will be found of great value if additional space is required.

A description of a case treated by Spinelli's operation is given by Crossen:¹

The inversion which was not complete had been present for many years and all attempts to reduce it by manipulation ended in failure. Crossen, after an interval for local treatment, cut through the vaginal mucous membrane close to the cervix uteri, and after separating the bladder from the uterus opened the peritoneum and enlarged the opening until a clear view could be obtained. He then incised the anterior half of the inversion ring, carrying the incision downwards through the whole thickness of the uterine wall; but was not able to reduce the inversion until the incision had nearly reached the fundus.

¹ Crossen, *Journ. of Amer. Med. Ass.*

This he effected by pressing in the mucous surface, after the uterus had been flattened, by opening out the incision and rolling the edges of the peritoneal surface round on each side towards the posterior aspect. Eventually the posterior peritoneal surface of the uterus was pushed forwards and the incision backwards, the fundus uteri still occupying the vagina. The restored uterus was then pushed up through the colpotomy incision and the divided uterine wall being now the anterior, the incision in it appeared in the colpotomy opening. On endeavouring to approximate the edges of this incision it was found

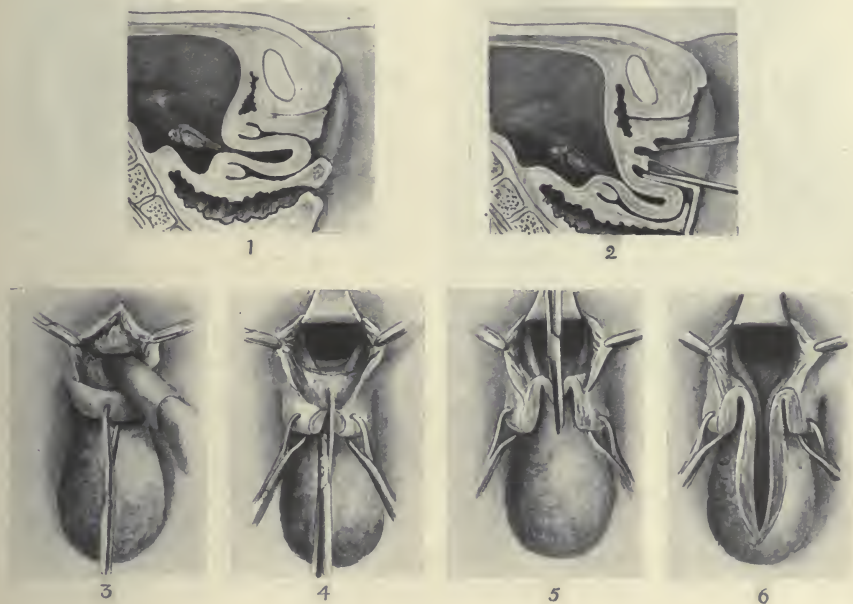


FIG. 361.—Spinelli's operation.

1, Section of pelvis and inverted uterus, etc., diagrammatic; 2, anterior lip of cervix and vaginal mucous membrane seized by volsella; 3, clearing utero-vesical cellular space; 4, utero-vesical peritoneum opened and anterior lip of cervix incised; 5, incising anterior wall of uterine body; 6, incision completed.

that the peritoneal edges could not be brought together owing to the shrinking of the peritoneal surface, and before accurate coaptation could be obtained it was necessary to excise a portion of the muscular wall and mucous membrane. The uterine wall was then sutured in two layers, one including the muscular portion, but omitting the mucous membrane, and the other the peritoneum. The colpotomy wound was then closed and a drainage tube left in the anterior opening, while another tube was introduced into the pouch of Douglas through a small incision in the posterior fornix. The difficulty in reducing the inversion was due entirely to the fibrotic condition of the uterine wall. In this case no

repositor would have been effective since the inversion was only replaced after the incision had been carried right to the fundus. The case is a good illustration of the difficulty caused by fibrotic changes.

In Dobbin's case described by Kelly¹ a laparotomy was performed and the inversion ring cut through in the middle of its anterior half. After replacement the

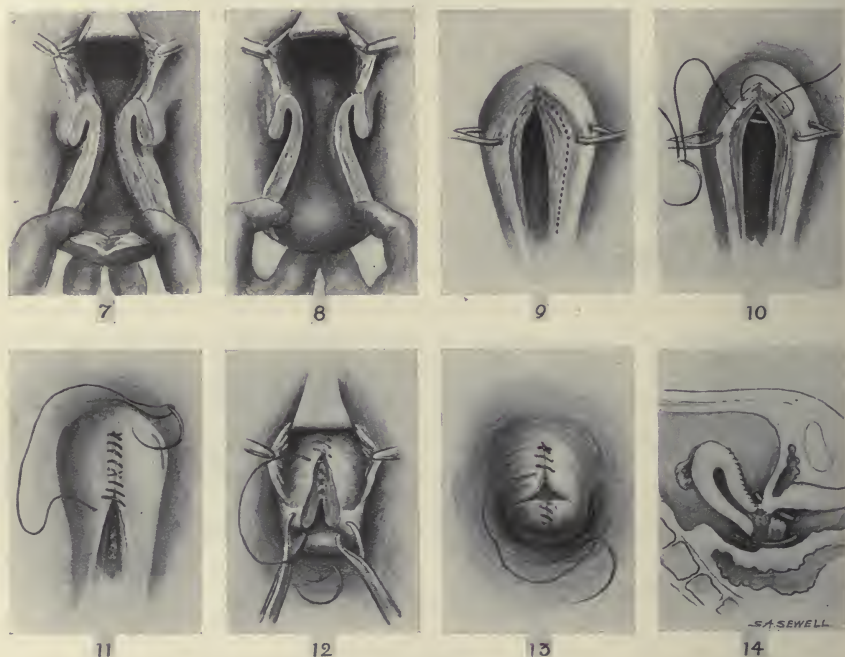


FIG. 362.—Spinelli's operation—(continued).

7, Commencement of reinversion; 8, reinversion continued; 9, reinversion completed, dotted line shows limit of uterine wall excised to allow of coaptation; 10, suture of muscularis of corpus uteri commenced; 11, suture of peritoneum of corpus; 12, suture of cervix; 13, suture of mucous membrane of vagina; 14, drainage tubes in anterior and posterior fornices.

wound presented the appearance of the incision in a classical Caesarean section. The patient, however, died of sepsis. In this case vaginal hysterectomy might have resulted in recovery.

Prognosis of Operative Treatment.—The mortality rates of the different operative procedures are rather striking. Of all the different methods those by the vaginal route have the smallest mortality. The objections to the vaginal route

¹ Kelly, *loc. cit.*

on the score of difficulty of manipulation and want of room can be balanced by the absence of shock and lessened liability to infection, while, as already stated, the second difficulty (want of room) can be to a great extent avoided by Schuchardt's incision, which will give material advantage, whether the anterior or posterior colpotomy incision is selected as the line of attack. If it is decided to amputate the inverted fundus first, no difficulty in removing the stump need be expected, but if the complete removal of the uterus in one step is decided on, Schuchardt's incision will facilitate manipulation very materially.

Jones¹ has collected a series of 128 cases of chronic inversion treated by operation. Of the 128 cases, 24 were dealt with by laparotomy and 54 by vaginal hysterectomy. In 28 of the 54, total, and in 26, partial vaginal hysterectomy was performed. Fifty cases were treated by colpotomy, 42 by the posterior route as suggested by Küstner, and 8 by the anterior route as suggested by Spinelli. Of the total number of cases 8 died, approximately 6 per cent. The mortality rate, however, varies in a very striking manner for the different operations. Of the 24 laparotomies, 5 died—just under 21 per cent. Of the 28 total vaginal hysterectomies, 2 died—just over 7 per cent. Of 26 partial vaginal hysterectomies, 1 died—just over 4 per cent. Of the colpotomy and hysterotomy operations, 50 in number, all recovered.

This statement accords with the experience of other operators and shows that colpotomy and hysterotomy are the least dangerous operations; that laparotomy is the most dangerous, and that vaginal hysterectomy as regards operative danger occupies an intermediate position, the mortality rate of total hysterectomy being greater than that of the partial operation. It seems safe to infer, however, that total vaginal hysterectomy would be more often performed in cases where sepsis was definite. This would account for the higher mortality rate.

The figures given may be taken as a strong argument in favour of the conserva-



FIG. 363.—Dobbin's operation for inversion. Stage I. Incision into anterior edge of inversion ring. (After Figure 363, Howard and Kelly, *Operative Gynaecology*.)

A, Round ligaments; B, anterior edge of inversion ring incised.

¹ Jones, *Surg. Gyn. and Obst.*, 1913, vol. xvi. pp. 632-650.

tive treatment of chronic inversion by the vaginal route, and obtaining access to the peritoneal cavity through a colpotomy incision. The anterior and posterior methods of access seem to give equally favourable results, and one of these should be the method adopted.

The care in manipulation necessary in cases of pathological inversion is shown by a case reported by Stark.¹ The inversion was apparently caused by a malignant growth which proved to be endothelioma. In the process of removing the latter



FIG. 364.—Dobbin's operation for inversion. Stage II. Uterus after restoration and before suture.
(After Figure 364, Howard and Kelly, *Operative Gynaecology*.)

the finger passed into the peritoneal cavity and a vaginal hysterectomy was at once performed, the patient making a good though not afebrile recovery.

The actual method adopted must to some extent rest with the operator; undoubtedly the confined space for manipulation and the difficulty caused by working to some extent in the dark will deter many operators from the use of the vaginal route; but the greater ease of the abdominal should not be allowed to militate against the adoption of the vaginal route unless the operator feels himself to be incapable of performing the operation in this way. The manifest advantage to the patient in lessened risk will outweigh any disadvantage due to prolongation of the operation owing to manipulative difficulty.

¹ Stark, *loc. cit.*

CYSTS AND TUMOURS OF THE FALLOPIAN TUBES

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Introduction.—The Fallopian tubes, which represent the upper non-fused portions of the Müllerian ducts, are situated in a region which abounds in foetal relics, some of which form a more or less complete representation of the original Wolffian system, others, which are claimed to be Müllerian, are only apparent when they undergo secondary pathological changes, whilst still another system of embryonic tubules are regarded by Keith as the homologues of the *rete testis* (a system of later development than the Wolffian); these relics are also to be detected only if cystic changes occur in them. With so many embryonic elements all lying close together within the folds of the mesosalpinx it is not surprising to find a divergence of views among pathologists as to the derivation of the numerous cystic formations which are commonly found adjacent to the tube. Some observers believe with Kossmann that *Müllerian* relics are widely scattered beyond the limits of the Fallopian tube and uterus into the mesosalpinx and even into the ovary. On the other hand von Recklinghausen and others attribute to *Wolffian* relics the tendency to trespass beyond the confines of the mesosalpinx into the tube itself, arguing that it is to be expected that where the Wolffian and Müllerian ducts crossed each other during development there should be an intermingling of Wolffian and Müllerian tissues. As this point of crossing corresponds with the future cornu uteri, von Recklinghausen attributed the formation of his cornual adenomyoma to Wolffian *rests* within the isthmic segment of the tube. Unfortunately for his theory, the specimens, which he made use of to illustrate it, were conclusively proved by Chiari and others to be examples of nodular salpingitis. There are many observers who still hold to the view that the tubes may contain mesonephric relics and that such may be the source of origin, not only of benign, but of cancerous tubal growths. It will thus be seen that in dealing with tumours and cysts of the tube much debatable ground will

have to be traversed, and, as will be found later, this remark applies not only to etiological considerations but also in large measure to the interpretation of features purely histological.

CYSTS OF THE FALLOPIAN TUBE

The following is a provisional classification of cysts of the Fallopian tube:

- I. Serosal 'cysts' formed as the result of obstruction, or due to a low type of chronic inflammation.
 - (a) Pseudo-cysts or dilated lymphatics.
 - (b) Peritoneal cysts.
- II. Mucosal cysts: Paratubal cysts derived from follicles formed from displaced mucosal epithelium.
- III. Cysts of congenital origin.
 - (a) Hydroparasalpinx.
 - (b) Accessory hydrosalpinx.
 - (c) Homologues of accessory hydrosalpinx (? pronephric).
 - (d) Fimbrial cysts (rete-testis cysts).
- IV. Degeneration cysts.
 - (a) Hydatid of Morgagni (dropsical fimbria).
 - (b) Cystic fibromyxoma.
- V. Cysts of parasitic origin.
 - Echinococcal cysts.

I. **Serosal Cysts.**—(a) *Pseudo-cysts.*—Irregular yellow blebs are sometimes seen projecting beneath the serous coat both of the tube and of the mesosalpinx. They represent dilated lymphatics and are found in conjunction with some cause of obstruction, such as a large pelvic tumour. When the parts are resected they subside and the lymph drains away. Such structures are not true cysts.

I. (b) *Peritoneal Cysts.*—In the absence of an obstructive agent multiple, small, shotty, glistening cystic bodies may be found on the surface of the tubes; these may be due to cystic changes occurring in downgrowths of cells from the serosa which are produced by a low form of chronic inflammation.¹ They are often not larger than a millet seed, and never bigger than a pea. They persist after the tube has been removed and are totally unlike lymphatic bullae. Another type of *serosal cyst* is seen in cases of salpingitis in which a serous exudate collects between the peritoneum and the muscle. Such a collection of serous fluid may

¹ See also 'The Serosal Theory of Iwanoff,' in Article on Adenomyomata (pp. 316-320).

become pedunculated. It is a local example of serous peritonitis. It is distinguished from a hydroparasalpinx by the absence of a lining of cubical epithelium, and also by the absence of muscle-fibres in its walls.

II. Mucosal Cysts : Paratubal Cysts.—In chronic tubal inflammation portions of the tubal mucosa may be squeezed from out the lumen into the muscularis and there form epithelial follicles. These follicles may undergo cystic distension (see Fig. 163, p. 336), and when their connection with the tube-lumen is maintained (see Fig. 161, p. 334) these intramuscular cystic spaces will be filled with the same fluid-contents as are to be found in the tube-lumen. It may thus come about that *cul-de-sac* exist in the muscle-wall, filled with serous, mucoid, or puriform fluid.

In chronic nodular salpingitis an entire node may thus become excavated and form a *paratubal* cyst. In some cases the cysts will communicate with the lumen of the tube by an opening which will easily admit a bristle; in others, all traces of a connection with the lumen will be lost. An origin from a mucosal source will then be open to doubt. The finding of a lining of cubical epithelium in such a cyst does not necessarily show that its source is *mucosal*, because such a lining may be derived from downgrowths of peritoneum, in which case the cyst would be *serosal* (*vide supra*). For examples illustrating the possible formation of cysts both from mucosal and serosal epithelium the reader is referred to Figures 142 and 147 (pp. 315 and 321) in the Article on Adenomyomata in this volume. The paragraphs on 'Epithelial Heterotopy' in the above Article should also be consulted for a clear appreciation of the changes resulting from epithelial displacement caused by inflammation. I have adopted the synonym *paratubal* for these mucosal cysts mainly for the reason that it expresses adequately their relation to the tube-wall; but this term also implies an analogy to Handley's *paratubal* haematocoele. The lesion in each starts in the lumen: in the case of the *paratubal* cyst, it is the epithelium of the mucosa which, by becoming cystic, excavates a portion of the tube-wall; in that of the *paratubal* haematocoele, it is the foetal epithelium (trophoblast) which excavates, or erodes, the wall of the tube and forms a blood-cyst.

An example of *paratubal* cysts, produced by chronic tuberculous salpingitis is shown in Figure 365. On the isthmic portion of the tube are seen two cysts, the size of small cherries; the smaller communicates with the lumen of the tube, the larger is shut off therefrom by scar-tissue. They were both filled with puriform tuberculous fluid of the same character as that which filled the remainder of the tube. The outer one-third of the tube formed a typical retort-shaped pyosalpinx, and to it was attached a cyst which was filled with inspissated tuberculous material.

The proximal and smaller isthmic cyst (Fig. 365, P), together with its

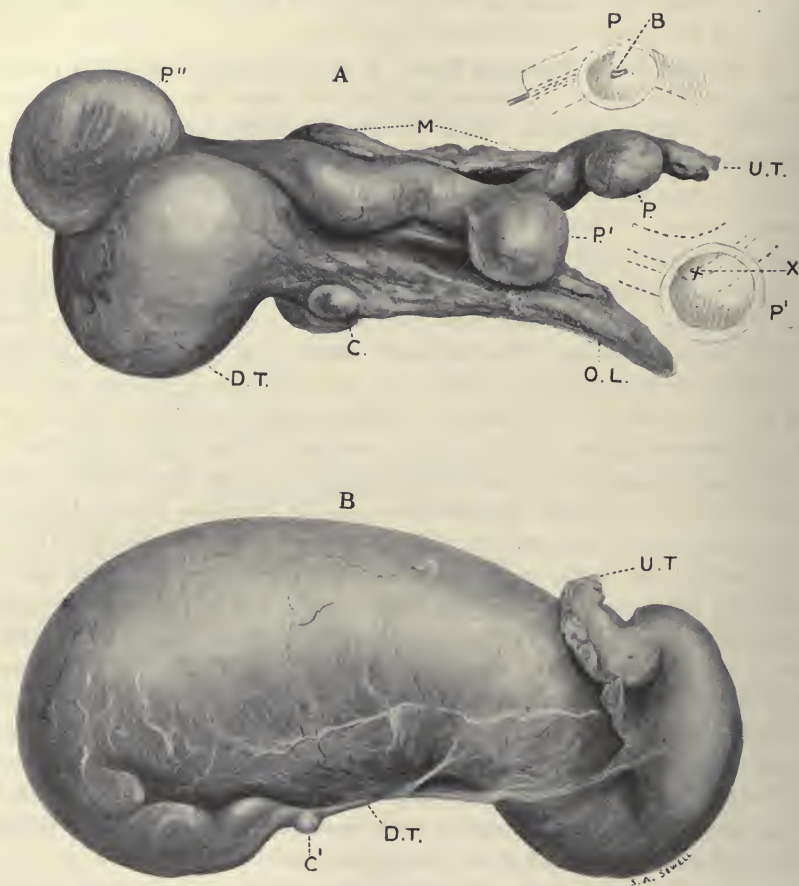


FIG. 365.—A, Right Fallopian tube, converted into a retort-shaped pyosalpinx. On the isthmic portion of the tube two paratubal cysts are seen (P and P'). On the ampullary portion of the tube a serous cyst is situated (P''). A small cyst (C) is seen on the ovarian ligament (O.L.). The upper inset shows a bristle (B) passing from the cyst (P) into the tube-lumen. The lower inset shows at point X the site of a scar in cyst (P') where it once communicated with the lumen of the tube. U.T., uterine end; D.T., distal end of tube; M, mesosalpinx.

B, Left pyosalpinx: D.T., distal end of tube; U.T., uterine end of tube; C', small cyst seen also in Figure 367.

connection with the lumen, appeared (when cut in vertical section) as a saccular or aneurysmal dilatation of the tube-wall. Seen in microscopic section its walls resemble those of a pyosalpinx. The outlines of the coarse isthmic plicae are still to be made out (see Fig. 366, B), but the plicae are thickened by inflammatory

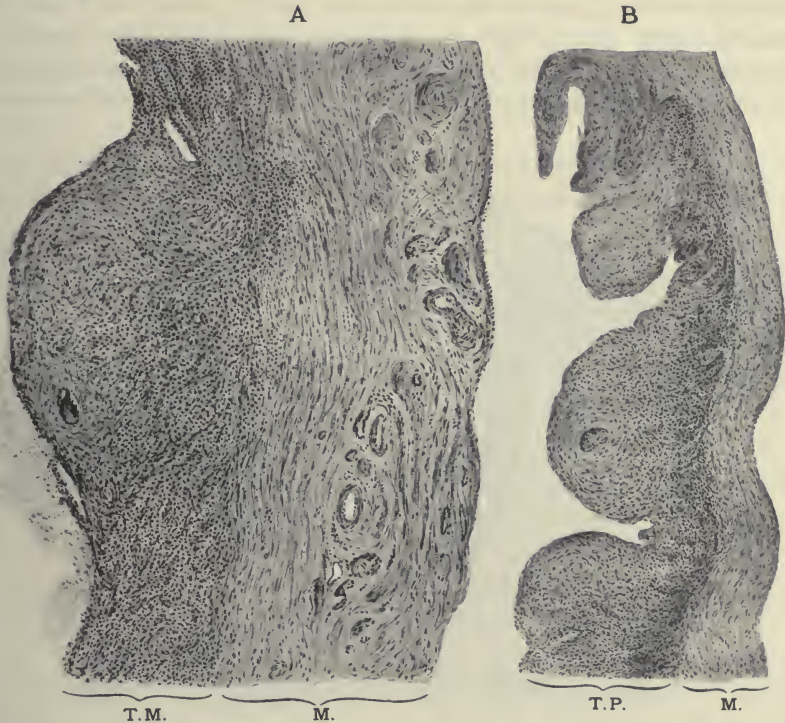


FIG. 366.—A, Wall of the paratubal cyst marked P' in Figure 365. T.M., Tubal mucosa destroyed by tuberculous granulation-tissue. M., Muscular layer of tube. B, Wall of paratubal cyst marked P in Figure 365. T.P., Plicae swollen by tuberculous infiltration. M., Tubal muscle.

infiltration in which tuberculous systems exist and young granulation-tissue is beginning to form, so that no cubical epithelial lining can be found.

External to the pyogenic lining comes the muscular wall of the tube, infiltrated with inflammatory cells and much thinned out.

The connection with the lumen admitted a bristle which passed outwards into the distal part of the tube quite easily. On the proximal side of this cyst the uterine end of the tube is quite impervious along its entire length of one centimetre. As before stated, the larger of the two isthmic cysts has no communication with

the lumen, but there is a dimpled scar on the outer side of the cyst which suggests that it was the site where the lumen of the tube and the cavity of the cyst were once continuous. The contents of this cyst were the same in character as those of the lumen of the tube. In microscopic features this cyst resembled the smaller one, excepting that no projections resembling plicae were to be seen (see Fig. 366, A). The nature of the large cyst (P'') attached to the bulbous end of the pyosalpinx is a matter of doubt; its walls show a tuberculous pyogenic membrane internally, and a thick fibrous coat externally, but no muscle-bundles could be distinguished.

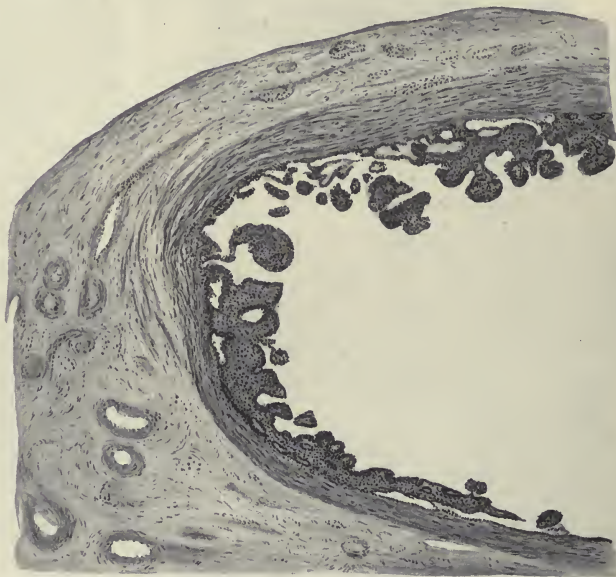


Fig. 367.—Wall of cyst C', seen in Figure 365, B. For description see text.

On the opposite side of the pelvis there was a banana-shaped tuberculous pyosalpinx. The mode of closure of this sactosalpinx was peculiar (see Fig. 365, D.T.). The abdominal extremity was drawn out to a fine point and for a distance of one centimetre it was impervious. There was a small mucosal cyst (Fig. 365, C') situated on the tube at the extremity of its pervious portion. This cyst appears to have been formed by simple sacculation occurring at the junction of the pervious and impervious terminal segments. The wall of this cyst is seen in Figure 367. It shows a lining composed of fused plicae and was probably produced by sacculation of the tube-

lumen. The patient from whom the specimens described above were removed was aged 24 years. She had passed through four years of sterile married life and had been treated for pulmonary tuberculosis which had apparently healed before operation.

III. (a) **Hydroparasalpinx**.—This is the name given by Kossmann¹ to small cysts which have a solid pedicle (Fig. 368, H) uniting them to the tube; he argued, without advancing proof, that they were derived from accessory tubes. Whilst distinctly Müllerian in origin the character of their lining membrane is similar to that of the commoner pedunculated cysts which arise from the Wolffian system (Fig. 368, W) (epoöphoron).

III. (b) **Accessory Hydrosalpinx**.—This is a condition which Sampson Handley² has shown can be produced when an accessory tube becomes closed at its fimbriated

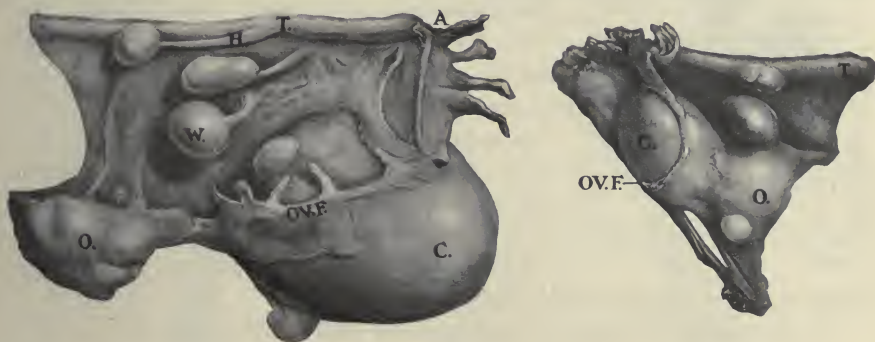


FIG. 368.—Appendages removed during hysterectomy for a myomatous uterus.

T, Tube; A, abdominal ostium; C, fimbrial cyst (rete-testis cyst); H, hydroparasalpinx; W, pedunculated epoöphoritic cyst; OV.F., ovarian fimbria; O, portion of ovary.

extremity, and at the same time becomes shut off from its connection with the lumen of the main tube. The specimen by which he proved his point is in the Museum of the Royal College of Surgeons of England (see Fig. 369). The proximal closure was caused by torsion of the pedicle. Handley provided the missing link in Kossmann's hypothesis by showing that an accessory tube may give rise to a tubal cyst. Another English observer, Hamilton Bell, was able to show that such a cyst may attain a size sufficient to render it clinically important.

A *saccular dilatation* of the ampullary part of the tube was described by Roederer in *Icones Uteri Humani Gravidi*. He thought it was peculiar to the gravid state, but Montgomery (as stated by Herbert Spencer) showed that this was

¹ *Zeitschr. f. Geb. u. Gyn.* Bd. xxix, S. 253.

² *Trans. Obst. Soc. Lond.* vol. xlv, p. 157.

not the case by finding it in the unimpregnated state. It is highly probable that Handley is right in suggesting that this 'tubal antrum' is an accessory hydrosalpinx.

III. (c) **Homologues of Accessory Hydrosalpinx.**—Single cysts, having no connection whatever with the tube-lumen, are frequently found springing from the anti-mesosalpingeal (upper) surface of the ampulla close to the fimbriated extremity. They mark the site of junction of that part of the tube which Keith considers



FIG. 369.—Hydrosalpinx of an accessory tube. (Mus. R.C.S. Path. Ser. 4582.)

to be pronephric in origin, with that part which develops from a groove in the outer part of the mesonephric (Wolffian) duct. They appear to me to represent an abortive accessory ostium, but as no accessory tube was ever formed it is not correct to designate them as accessory hydrosalpinges (see Figs. 370 and 371). Even those embryologists, who do not agree with Keith that the outer part of the terminal funnel of the tube is pronephric, admit that this end-segment is imperfectly united with the rest of the tube in many instances. Thus the proximal end of the funnel is described by Tandler as being, at first, quite blind and as joining up later with the rest of the tube. It is at this junction that develop-

mental defects are liable to occur; they include:

1. The formation at this site of an accessory tube with an ostium of its own.
2. The formation of a sessile ostium.
3. The subsequent formation of a hydrosalpinx of the accessory tube (Handley).
4. The formation of a cyst such as that shown in Figures 370 and 371 which

must be regarded as the homologue (abortive homologue) of an accessory hydrosalpinx, the differences being (1) in these simple cysts there has never been any communication with the lumen of the tube (see Fig. 371); (2) they show no signs of a plicated mucous fold (see Fig. 371); (3) their lining consists merely of a single layer of low cubical epithelium similar to that seen in a small epoöphoritic cyst (Fig. 370); (4) they are far more common than their homologue of more advanced development, the true accessory hydrosalpinx.

III. (d) **Fimbrial Cysts.**—The hilum of the ovary at its outer pole contains a collection of tubules which are homologous with the *rete testis* of the male. In young subjects these tubules can be traced outwards and upwards along the ovarian fimbria of the Fallopian tube. In the appendages of a girl three years of age I have detected minute cysts the size of a pin's head immediately internal to the attachment



FIG. 370.—Left appendages, posterior view.

AO, Abdominal ostium; C, cyst on the ampullary portion of the tube; T, tube; O, ovary; W, epoöphoritic cyst. The cyst C is homologous with an accessory hydrosalpinx (see text).



FIG. 371.—Homologue of accessory hydrosalpinx.

A, Small cyst attached to ampullary portion of the Fallopian tube (nat. size); B, the same ($\times 10$); C, portion of the cyst-wall ($\times 80$); it shows the lining to consist of a crenated layer of low cubical epithelium (e). This cyst is to be regarded as the homologue of an accessory hydrosalpinx.

of this fimbria to the ovary. As this fimbria belongs to the tube, the above cysts are classed as *tubal* under the heading of 'fimbrial cysts,' but it must not be forgotten that they are not Müllerian neither are they Wolffian, but are the homologues of what Keith calls a "fourth element" or "new formation," viz. the *rete testis*, which are developed *after* the vasa efferentia and coni vasculosa are formed from the genital Wolffian tubules.¹

These fimbrial cysts are only to be distinguished from cysts of the epoöphoron and paroöphoron by their *position*. When of moderate size they will not have trespassed far into the mesosalpinx, but will come to occupy its outer part only (see Fig. 368). The ovarian fimbria will be seen to stretch across their surface to reach the ovary below. When they attain a size sufficient to occupy the entire mesosalpinx they are indistinguishable from a large epoöphoritic cyst, which they then resemble in every respect. It thus comes about that a large intraligamentary (mesosalpingeal) cyst may be either fimbrial, epoöphoritic, or paroöphoritic in origin, as all these types are capable of increasing in size to an equal extent.

The clinical features of fimbrial cysts will be described in the article dealing with ovarian tumours (see p. 801).

IV. (a) Degeneration Cysts.—Cysts of the *Hydatid* of Morgagni may attain

¹ After reading this article 'in type,' Professor Arthur Keith added the following :—The 'rete' element in the male effects a junction with the seminiferous tubules of the testicle, on the one hand, and with the Wolffian tubules (epididymis) on the other. In the female the 'rete' element is laid down, but in most individuals it disappears in the course of development. Almost without exception cysts situated in that part of the broad ligament which stretches between the fimbriated end of the tubes and the outer pole of the ovary and in the region of the ovarian fimbria are developed from rests of the rete element.

FIG. 372.—Cyst of broad ligament. ($\times 80$.)

Small cyst ($\times 80$) of the broad ligament lying close to the tube (which is not shown). The epithelial lining (e) of this cyst is similar to that of the tubal cyst shown in the preceding figure.



the size of a Williams' pear (Doran); they are, of course, tubal in origin, in fact, they are nothing more than dropsical fimbriae (see also page 805).

IV. (b) **Cystic Fibromyxoma.**—Doran¹ quotes a remarkable case of Sanger in which a congeries of fibrocystic masses (see Fig. 373) sprang from the fimbriae of the tube. The patient was aged twenty-six; the tumours were detected after labour, and removed four months later. Their pedicles were simply ligatured and divided, but the Fallopian tube itself was not removed. The opposite tube was normal and the patient subsequently became pregnant. The cystic masses were of

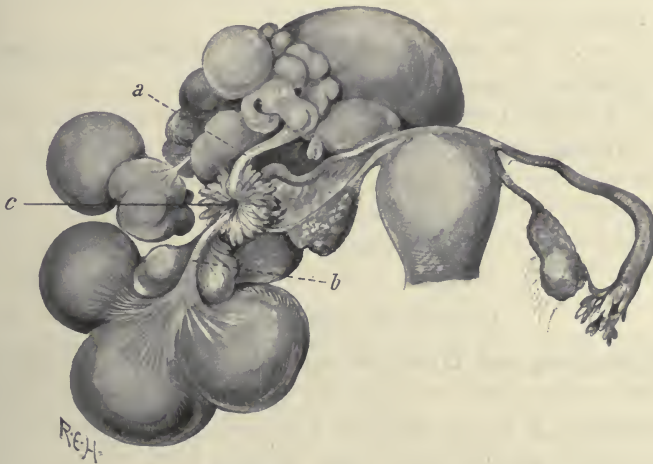


FIG. 373.—Cystic fibromyxoma of the fimbriae (Sanger).
a, b, Fimbriae forming pedicles to the cysts; c, ostium of the tube.

different colour, some white, others yellow, and others deep red. Sanger regarded the case as a *cystic fibromyxoma* of congenital origin.

V. **Echinococcal Cysts** of the tube have been mentioned on p. 728, Vol. I.

SOLID TUMOURS OF THE TUBE

Solid growths of the tube are classified as follows :

A. Mesoblastic Tumours—

- I. Innocent : (a) Enchondroma and Chondrofibroma.
- (b) Lipoma.
- (c) Lymphangioma.

¹ *System of Gynaecology*, Allbutt, Playfair, and Eden, 1906, p. 499.

- (d) Fibroma.
- (e) Fibromyoma.
- (f) Adenomyoma (placed here for convenience).

II. Malignant: (a) Mixed Tumours.

- (b) Sarcoma.
- (c) Perithelioma.

B. Embryological Tumours—

- (a) Teratoma.

C. Foetal Tumours—

- (a) Chorionic Carcinoma or Chorionepithelioma.

D. Epiblastic Tumours—

I. Innocent: (a) Papilloma.

II. Malignant:

- (a) Malignant Papilloma.
- (b) Adenocarcinoma.
- (c) Secondary Tubal Cancer.

INNOCENT MESOBLASTIC TUMOURS

(a) **Enchondroma and Chondrofibroma.**—Chondromatous metaplasia of connective-tissue stroma-cells are frequently met with in mesoblastic growths in various situations. It is not surprising, therefore, that small tumours, composed entirely of cartilage or consisting of fibrous tissue in which islands of cartilage are present, have been described as arising from the tubes. Doran considers that these tiny growths are allied to the embryomata. An example of this kind frequently quoted is that of Thiébault,¹ of Brussels, in which a tumour the size of a hazel-nut was attached to the ampullary portion of an old thickened tortuous Fallopian tube, the ostium of which was occluded. On microscopic examination this was found to be a pure enchondroma consisting of hyaline cartilage with large and small cells. The central portion was softened and the outer layers contained areas of calcification.

A small tubal growth consisting of fibrous tissue and cartilage has been described by George W. Outerbridge.² The tumour lay in the lumen of the tube internal to the site of an ectopic gestation; it was quite distinct from the latter and was regarded by Outerbridge as being a 'causal factor' in its production. The growth practically filled the lumen, which measured 1 cm. in diameter, its surface

¹ *Annales de l'Institut St. Anne*, 1895, and Jacobs' *Bulletin de la Soc. Belge de gyn. et d'obst.*, 1897.

² Outerbridge, *Amer. Journ. of Obst.*, August 1914, vol. lxx. No. 2, p. 173.

was papillary and it was quite free, having no attachment to the tube-wall at the time of examination, but it was thought that a pedicle had once existed.

Areas of cartilage have been found in malignant tubal growths of mixed type; a good example of this is afforded by a case recorded by von Franqué¹ under the title of *carcino-sarco-endothelioma* of the tube. In a section taken from the growth in the left tube there is an area of hyaline cartilage surrounded by a zone of fibrous connective tissue which cuts it off almost entirely from the neighbouring 'endotheliomatous' areas of the main growth (see Fig. 374, B). Such a combination of endothelioma and chondroma is not uncommon in the parotid gland and in other situations.

(b) **Lipoma of the Tube.**—A case of lipoma of the oviduct was described in 1891 by Parona.² The tumour weighed nearly three ounces and lay between the folds of the broad ligament. The tubal wall was partially buried in the fat; traces of tubal mucosa with ciliated epithelium ran through the lipoma. It is highly probable that the tumour arose in the mesosalpinx and infiltrated the tube.

Doran described a small fatty tumour hanging from the Fallopian tube, close to the root of the ovarian fimbria, which he regarded as a tubal lipoma, and he mentions the presence of fat under the mucosa of the tube and sees no reason why a lipoma should not develop in the substance of the tube.³

(c) **Lymphangioma of the Tube.**—Adam P. Leighton⁴ reported a case under the above title, and states that four others have been recorded, and also one case of lymphangioma of the broad ligament.

Leighton's case was from Schauta's Klinik in Vienna and had been demonstrated as a lymphangioma by Oskar Frankl. The patient was aged thirty-eight years, she was the subject of a uterine fibroid and of a small ovarian cyst. There was a swelling in the centre of the left tube smaller than a pea, which on palpation was hard and resistant. It was composed of "loose connective tissue filled with cavities or crypts." The cavities were lined by a single layer of endothelial cells. It was quite innocent and represented, according to the author, the smallest and earliest stage of a true lymphangioma, that described by Höhne in 1901 and that of Franz (1909) being each the size of a cherry, whilst that of Dienst (1905) resembled a pea in point of size, and Kermauner's case that of a bean.

Leighton states that these nodes are true new growths and not merely lymphangiectases. They have never been found apart from fibroids of the uterus,

¹ *Zeitschr. f. Geb. u. Gyn.*, 1902, 47, p. 211.

² "Caso di lipoma all' ovaia ed ovidotto di destra," *Annali di Ostet. e Ginec.*, 1891, p. 103.

³ *System of Gynaecology*, Allbutt, Playfair, and Eden, 1906, p. 501.

⁴ Adam P. Leighton, *Amer. Journ. Obstet.*, April 1912, pp. 573-581.

and he endeavours to show an etiological connection between the two conditions. The symptoms noted are accounted for by the co-existent fibroids of the uterus.

(d) **Fibroma of the Tube.**—Only one case of pure fibroma has been recorded, viz. that of Rudolph published in 1898.¹ The growth was the size of a pigeon's egg and arose from the floor of the middle segment of the left tube. It grew out between the layers of the left broad ligament. In consistence it was very hard and, histologically, was found to be composed of interlacing fibres of dense white connective tissue with very few cellular elements. No muscle-fibres could be found. The uterus was the seat of an adenomyoma.

(e) **Fibromyoma of the Tube.**—M. Auvray in 1912² collated 29 cases of tubal fibromyomata and he gives a brief account of each. Several cases are open to doubt; thus Doran considers that Simpson's and Schartz's tumours might have been pedunculated fibroids of the broad ligament. Very few of these growths attain dimensions sufficient to render them of clinical importance (see Fig. 156, p. 328), but one recorded by Auvray weighed 2800 grammes (about 43 lbs.). It was attached to the outer extremity of a malformed tube, the uterine end of which was blind and did not communicate with the cavity of the uterus, whilst the central portion was represented by a large hydrosalpinx. Other examples of considerable size are reported by Le Dentu, Stolz and Eppinger, Barette and Fehling.

Fibromyomata may arise from any part of the tube, and three have been recorded as arising from the ovarian fimbria (Auvray, Le Dentu, and Lecène). In number they are generally single, but one notable exception is that reported by Péraire³ in which there were said to be two fibromyomata weighing 1 lb. in the right tube, together with multiple fibroids of the uterus and fibromyomata of both ovaries. Tubal 'fibroids' are almost invariably unilateral, only one case being recorded where both tubes were the seat of these growths.

Quénu and Longuet classified tubal 'fibroids' after the uterine types; and Auvray also adopted the same classification, thus dividing them into subperitoneal, interstitial, and submucous, and states that the submucous variety is rare whilst the subperitoneal is the commonest. The latter generally project towards the peritoneal cavity, but they may open up the layers of the broad ligament as happened in cases reported by Rudolph and by Bland-Sutton.

Subperitoneal tubal fibroids are usually pedunculated, and the pedicle may undergo torsion (Barette). They may also become calcified as in a case of my

¹ *Archiv für Gynäk.*, 1898, vol. lxvi. p. 83.

² *Archiv. Mens. d'Obstétrique et de Gynécol.* 1^{re} Ann., No. 1, January 1912, pp. 1-25.

³ *Bull. de la Société anatomique*, 1903, p. 373.

own and in the second case of Barette which grew from the middle segment of the tube and measured 12 cm. in its largest diameter.

The *interstitial tubal fibroid* shows a disposition to a concentric arrangement, as though it represented a more or less regular increase in the fibromuscular elements of the tube; e.g. in Carrière and Legrand's case the tubal canal passed through the centre of the fibroid which formed a small, painful swelling diagnosed as an ovarian tumour. Such cases have been recorded by Pilliet, Low, Formiggini, and Taylor. There is much doubt as to the real nature of tumours of this type, some at all events appear to be the product of inflammation, e.g. examples of *salpingitis nodosa* (see Article on Adenomyomata, Vol. II. p. 303); some authorities hold them to be analogous to the fibrous nodules which are found in the epididymis as the result of gonorrhoeal orchitis, i.e. examples of local interstitial fibrosis. This view is supported by the fact that histologically it is often found that fibrous tissue predominates and that the muscle-fibres are few and far between. Auvray is, however, convinced that the *concentric interstitial fibromyoma* has been demonstrated histologically in the cases of Formiggini and Taylor.

The *submucous tubal fibroid* is represented by the case of Wettergreen, in which a pedunculated tumour measuring $1\frac{1}{2} \times 3$ cm. protruded from and partially obstructed the abdominal ostium. Decidual tissue was detected at its base, and Doran raised doubt as to its being a fibromyoma at all.

A tubal calculus discovered by J. L. Green at a necropsy on a widow, aged eighty, was recorded by Ballantyne; it lay in the tubal canal and may possibly have been a calcified tubal fibroid.

Tubal fibroids which have attained a considerable size are liable to undergo the same secondary changes as seen in the uterine type. Examples of calcification have been mentioned, hyaline liquefaction (cystic degeneration) and necrosis were present in Auvray's case. Several cases of lymphangiectatic change have been noted. Suppuration was said to have occurred in the case reported by Thomas. Adhesions to adjacent organs, e.g. intestine, omentum, are recorded. Torsion of pedunculated growths has already been referred to. The co-existence of tubal gestation has twice been observed (Wettergreen, Lecène). The co-existence of fibroids in the uterus has frequently been noted.

Symptoms.—There is nothing pathognomonic in either the signs or the symptoms. *Pain* and *metrorrhagia* have several times been noted. Small nodules may be located on the tube with precision but they will be regarded as nodular salpingitis; larger tubal growths will be diagnosed as uterine or ovarian, and for such, a tubal origin can only be made out by opening the abdomen.

The treatment is removal, and when the tumour is pedunculated the tube may be left *in situ*.

(f) **Adenomyoma of the Tube.**—Much doubt exists as to whether the condition described by this name is a true new growth or not. It is quite certain that the majority of recorded cases represent Chiari's *salpingitis isthmica nodosa*, and for a discussion upon this subject the reader is referred to the Article on Adenomyomata (pp. 333-336). It may, however, be mentioned here that a remarkable case, described by R. Meyer, of a large bi-lobed tumour arising near the cornu uteri by a pedicle through which ran the isthmic portion of the tube, was certainly a true neoplasm composed of fibrous and glandular tissue. It is difficult to explain such a growth except by regarding it as arising from foetal relics. The cases recorded by Glendining and Frances Ivens I regard as examples of epithelial heterotopy produced by chronic salpingitis.

MALIGNANT MESOBLASTIC TUMOURS

(a) **Mixed Tumours.**—Quénu and Longuet,¹ in their classified account of tumours of the tube, place three cases under the above heading because there was histological evidence that the growths were composed both of embryonic connective tissue and cylindrical epithelium. The tumours in question were described by the authors who published the cases as *sarcomata*.

The first case is that of Senger² of Breslau (1886), the specimen was obtained at the autopsy of a woman aged thirty-one, who died from diabetic coma and had suffered from no symptoms referable to the pelvis. The left tube was dilated in its ampullary segment to the size of a pigeon's egg by a soft polypoid growth of yellowish colour which was surrounded by a chocolate-coloured fluid. The polypoid growth was papilliferous. The centre of each papilla was composed of vessels and round cells the size of leucocytes. The latter are described as small round sarcoma-cells arising from the mucous membrane. Externally the papillae were described as carcinomatous. There was a small metastasis in Douglas's pouch, the structure of which was similar to that of the primary tubal growth. In Allbutt and Eden's *System of Gynaecology* (1906) Doran included this case among the sarcomata, adding that Coe of New York regarded the same tumour as an inflammatory product. The present writer has never met with a *polypoid* inflammatory node, and is disposed to regard the case as one of papilloma altered by inflammation. Since there was a metastasis in the pouch of Douglas, the papilloma must be regarded as having become malignant.

¹ Quénu and Longuet, *Revue de Chirurgie*, 1901, 24, p. 744.

² Sometimes misspelt as though the late Professor Sängér of Leipzig reported the case.

The second case was reported by Sanger (1890) ; it was that of a woman aged forty-two years, who had noticed abdominal enlargement for six months. The left tube removed by operation had the appearance of small intestine. It was filled with papilliferous vegetations. The same were present to a less degree in the right tube. Six months after operation the patient died with metastases in the uterus and inguinal glands. Histologically Sanger regarded the tumour as a sarco-carcinoma, the sarcomatous tissue being represented by masses of small round cells in alveoli, the cancerous part consisting of cylindrical epithelium which penetrated and took part in, the construction of the growth.

The third case is that of von Kahlden (1891). The patient, aged fifty-one, complained of a sense of weight in the hypogastrium for three months, and after an illness lasting three years died of cachexia. The right tube was the seat of a tumour measuring 16×19 cm. ; it was intimately connected with the mucosa of the tube. The left tube contained a still larger tumour. The growths extended to the ovaries, and there were several metastases on the peritoneum. The tumours are reported as consisting of sarcomatous elements, including round and oval cells and large multinuclear giant-cells, all of which were found invading the lymphatics of the broad ligament. In the centre of the tubal growths were epithelial elements arranged in columns and masses ; these were traced to the mucous membrane. The ovarian and broad-ligament deposits were secondary to the large tubal growths.

On these three cases Quenu and Longuet remark that although they were published as sarcomata by the respective authors they are better considered as *mixed tumours* or designated adeno-sarcomas or carcino-sarcomas.

The best recorded case of a mixed tumour of the Fallopian tube is that of v. Franque,¹ to which reference has already been made (p. 725). The patient was a unipara aged fifty-one years. She had menstruated regularly up to the age of fifty, and during the year prior to operation there had been irregular losses of blood for eight months, followed by four months' amenorrhoea and enlargement of the abdomen. Three weeks before operation the patient was seized with violent pain whilst at work, and this was followed by fever. The growth, which reached nearly to the umbilicus, was partly solid and partly cystic. *Per vaginam* a second tumour was made out. The operation was very difficult and the patient died two days later. The larger tumour sprang from the left Fallopian tube ; but both tubes showed the presence of carcinomatous growth arising from the surface-epithelium and a sarcomatous growth invading the walls of the tube. The latter appeared to have been the first to develop, and the large mass springing from the left tube was mainly

sarcoma. Within this tissue there were areas of typical endotheliomatous growth, and a mass of cartilage (see Fig. 374). The growth had invaded the left broad ligament; in this situation its structure was that of "a pure sarcoma." There was a polypoid sarcomatous metastasis in the cavity of the uterus.

To the four examples of 'mixed tumours' of the tube Bourrély adds a fifth example, that of Schaefer.¹ The patient, a secundipara, was aged 43 years; the last pregnancy was 23 years ago. The periods were regular. An increase in size of the abdomen had been noticed for two months. Two tumours were discovered, one on

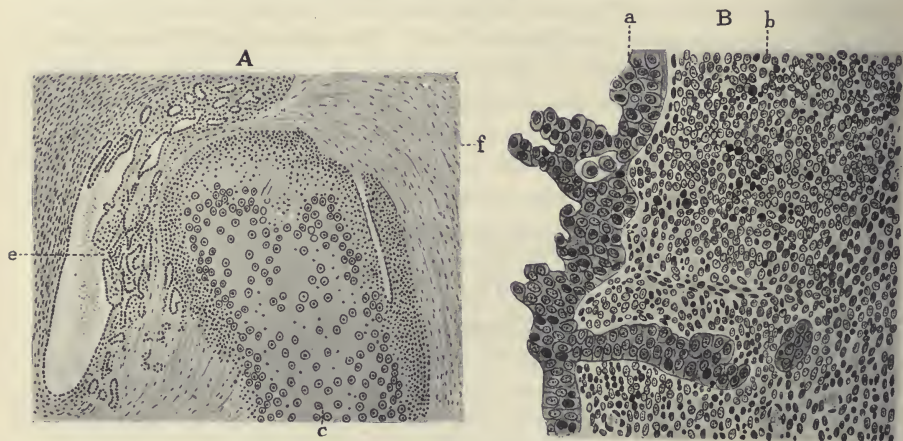


FIG. 374.—Sections from a primary tubal growth of mixed type.
(After von Franqué, *Zeitschrift f. Geburtshilfe u. Gynäkologie*, Bd. xlvii.)

A, Section of a node of hyaline cartilage resembling a foetal phalanx. It lay in a malignant tubal growth; e, endothelial elements; f, fibrous tissue. B, Another portion of same tubal growth; a, epithelium showing early cancerous change; b, sarcomatous tissue.

either side of the uterus; they were removed, but the uterus, which was enlarged, was left *in situ*. The patient developed ascites and secondary growths on the peritoneum; she died eighteen months after the salpingectomy. The right tumour was a hydrosalpinx, and showed no sign of malignancy. The left tube was cystic and contained odourless puriform fluid. Growing from the mucous membrane were cauliflower-like masses of new growth. This was composed of "sarcomatous and carcinomatous elements."

Finally H. R. Spencer's² fourth case of tubal carcinoma may here be mentioned

¹ Charles Bourrély, *Tumeurs primitives des trompes*, Thèse, Montpellier, 1910; also K. H. Schaefer, *Ein Beitrag zur Kasuistik des primäres Tubencarcinom*, Leipzig, 1901.

² *Proc. Roy. Soc. Med. (Obst. and Gyn. Sect.)*, June 1916.

as having areas of atypical new growth, interspersed amidst definite carcinomatous tissue, which some authorities would describe as sarcomatous.

(b) **Sarcoma of the Tube.**—After eliminating the *mixed tumours* Quénu and Longuet briefly mention six cases which they accept as primary sarcomas of the tube, viz. those of Gottschalk (1886), Janvrin (1889), Jacobs (1897), and three cases of Dixon Jones. Of these six, four are lacking in clinical data.

Dixon Jones' three specimens were obtained at autopsies—one was reported as a round-celled sarcoma, one as a spindle-celled sarcoma, and the third as a melanosarcoma; in all three myeloid cells were found. The author was said to be able to trace the gradual transformation from muscle-cells into the cells of the 'myelomata.'

These cases have a clinical interest in that the three patients died of internal haemorrhage, extra-uterine gestation being the diagnosis in each case.

The case of Janvrin was that of a tumour in a tube removed by operation. It measured only 2 cm. in its greatest diameter. The lumen of the tube with its intact epithelium ran through the tumour in a tortuous manner. The corresponding ovary was normal. The tubal peritoneum and mucosa were intact. The tumour had developed in the muscularis. It was composed of dense white and yellow elastic fibres containing zones of cartilaginous tissue and cells of various shapes and sizes. It was in no sense inflammatory. Janvrin designated it a *myxosarcoma*. This case is not disputed by either Quénu and Longuet or by Doran.

Gottschalk's case was that of a tumour the size of a nut which sprang from the right tube, and close to it was attached a haemorrhagic cyst. The tube-lumen was pervious. There were some retroperitoneal nodes beneath the pouch of Douglas. Both the tumour and the retroperitoneal nodules had a similar structure which was that of a small spindle-celled sarcoma.

Jacobs' case (1897) was that of a growth the size of an orange which developed from the muscular wall of the left tube. It was adherent to the adjacent tissues. It was formed of very soft friable tissue, having the macroscopic appearance of a sarcoma. The tube showed evidence of interstitial salpingitis, and the abdominal ostium was closed. The left ovary was enlarged by small cystic disease; it was independent of the tubal growth. Microscopically the growth was a myosarcoma.

It appears from these cases that sarcoma has its origin in the muscular wall of the tube. It is unilateral, either tube being liable to involvement. In dimensions it has varied from the size of a nut to that of an orange. The lumen of the tube may be pervious, or salpingitic closure may be present. Metastases have been

found under the pelvic peritoneum and in the liver. In structure they are mostly *myosarcomata*, but giant-cells may be present and the cellular elements may be myxomatous. Finally they may contain melanin granules (melanoma).

Two other cases have appeared in the literature since the publication of the above, one by Jacobs¹ (1905) which is described by Doran as the eighth genuine case, and another by Scheffzek² (1911). The latter was that of a woman aged sixty-one who developed a soft friable tumour the size of a goose's egg on the left tube. The growth was made up of short spindle-cells with many large multinucleated cells between them. Küster agreed that it was a sarcoma, whilst Fränkel was doubtful. The case was diagnosed as an ovarian tumour. The symptoms were a foetid discharge and loss of weight. The uterine cavity was shown by curettage to be normal.

The case of C. Jacobs (which is the second this author has reported, the first being published in 1897 (*vide supra*), and this one in 1905) was that of a multipara aged twenty-seven, whose only symptoms were menorrhagia and pain in the *upper* abdomen. The lateral fornices were filled by two irregular masses, and ascites was present. Tuberculous peritonitis was diagnosed and the abdomen aspirated. Three months later, laparotomy was performed and everything found to be adherent. The proximal ends of the tubes were hard but of normal size; the tumour occupied the distal halves of the respective tubes, that on the left was the size of two fists, that on the right a little smaller. They were both composed of soft smooth lobules like grapes, which floated in the ascitic fluid. The consistence of the lobules was soft and gelatinous. Enlarged glands were removed from the sacral regions. The stroma was composed of fusiform sarcoma-cells undergoing myxomatous degeneration; the surface of the lobules was covered by ciliated epithelium. The patient was reported well two months after operation.

Under the heading of sarcomata may be mentioned the case of "primary mesothelioma of the Fallopian tube" recorded by Clara Eglington.³ The patient was a multipara, aged forty-seven, from whom J. B. Hellier removed the left Fallopian tube and adherent ovary. The outer part of the tube presented a bulbous extremity the size of a pigeon's egg; it contained a friable shaggy mass which filled the lumen and appeared to involve the wall as far as the peritoneal coat. The individual cells were like those of sarcoma whilst the general arrangement resembled a carcinoma. As the Müllerian duct is mesothelial in origin the reporter designated the growth *mesothelioma*.

¹ *Le Progrès Médical Belge*, April 15, 1905; and *Journ. Obstet. and Gyn. Brit. Emp.*, 1905, vol. vii.

² *Zentralblatt für Gynäk.*, 1911, 35, S. 935.

³ *Journ. Obstet. and Gyn. Brit. Emp.*, 1912, vol. xxi. p. 169.

The accompanying symptoms were pain and a watery vaginal discharge. There was a history of probable gonorrhoea of twenty years' standing. This tumour is again referred to under "Adenocarcinoma" (p. 756).

Symptoms.—The clinical data are very scanty and nothing characteristic of this tubal lesion has been recorded. Violent hypogastric pain was the prominent symptom in Gottschalk's case. In that of Jacobs there was menorrhagia clearly due to a piece of retained placenta. The patient died of cachexia with growths in the liver and elsewhere. Treatment is based on the principle which underlies that for malignancy elsewhere; and comprises therefore free removal of the internal genitalia *i.e.* of the uterus and both appendages.

(c) **Primary Perithelioma of the Tube.**—Primary perithelioma of the uterus and of the ovary has been several times recorded; I can find only two authentic instances of this type of sarcoma occurring primarily in the tube, *viz.* that of Gosset¹ and that of Barbour and Watson.²

The patient in Gosset's case was aged forty-four; the main symptom was a *constant serous discharge* for three years; there was no pain and the periods were regular. There was no loss of flesh. The tumour was a bulky, sausage-shaped, firm, *lobulated* growth of the left tube (see Fig. 375), the left ovary being healthy. The tumour was lightly adherent to the intestine. There was a small metastasis in the omentum. The right tube formed a hydrosalpinx. The tumour weighed 1½ lbs. and measured over eight inches. Herrenschmidt and Bossel of the Institut Pasteur pronounced it to be a perithelioma, or, as Waldeyer would call it, a plexiform angiosarcoma.

Barbour and Watson's patient was an unmarried multipara aged fifty-three. She suffered from pelvic pain and *irregular blood-stained discharge* which came on two years after the menopause, and there was an abdominal swelling reaching to the umbilicus. This was caused by a tumour of the left Fallopian tube and by a cystic right ovary the size of a foetal head. The tubal growth was hard, nodular, and adherent. There were many secondary nodules on the corresponding ovary. Both tubes and ovaries were removed, but it was impossible to deal with the secondary growths. The patient died eleven days after the operation. The tumour measured four inches in length and seven inches in circumference; it occupied the ampullary and infundibular parts of the tube. The cut surface was yellowish-white and of brain-like consistence. It contained haemorrhagic areas and necrotic tissue. The microphotographs reproduced in the authors' paper show clearly that the growth

¹ *Annales de Gynéc.*, 1909, 11th series, vol. vi. p. 271.

² *Journ. Obst. and Gyn. Brit. Emp.*, 1911, vol. xx. p. 116.

was a perithelioma. The above authors point out that perithelioma of the tube is far more malignant than the same disease occurring in the uterus.

Primary perithelioma of both tubes is mentioned by G. Müller.¹ The patient was admitted into the Klinik Pitha. I have only been able to find a brief reference to this case.

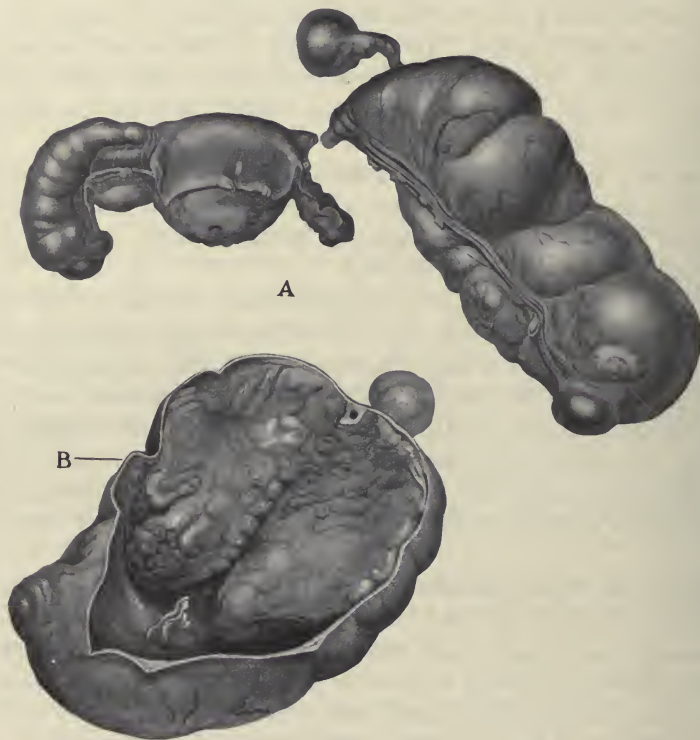


FIG. 375.—Primary perithelioma of the Fallopian tube. (After Gosset.)

The external lobulation, which is a characteristic feature, is well seen in A. B shows the tube laid open and demonstrates the dense solid character and the nodular features of the tumour.

(d) **Secondary Perithelioma of the Tube.**—A good illustration of the contrast, in the degree of malignancy, between a primary *tubal* perithelioma, such as that mentioned above, and primary *uterine* perithelioma, is afforded by a case published by Doran and myself.² The specimen was erroneously described as

¹ G. Müller, *Zent. f. Gynäk.*, 1915, 39. S. 451.

² *Journ. of Obst. and Gyn. Brit. Emp.*, 1908, vol. xiv. pp. 320-330.

a cystic uterine *fibroid* showing peritheliomatous change. There was no 'fibroid' present, the growth being a primary uterine *perithelioma* with extensions into the broad ligament, Fallopian tube, round ligament, and ovary of the left side. The patient was a healthy-looking multipara aged thirty-six. Fifteen months before operation a swelling was noticed in the left side of the abdomen; it had grown rapidly. The periods had been somewhat profuse for six months, and there had



FIG. 376.—Uterus and appendages seen from the front. (Doran and Lockyer.)

The left tube (B), together with the mesosalpinx, is the seat of secondary perithelioma. Note the nodular character of the growth. The primary growth was in the uterus. A, Right ovary; C, large solid growth on left broad ligament; D, cystic part of same.

been slight intermenstrual haemorrhage—prior to this they were normal, appearing every three weeks. On examination a lobulated tumour reaching to above the umbilicus was found; it was partly hard and solid, and partly cystic; its mobility was limited. After examination a severe 'period' set in which delayed operation for a fortnight. Removal was rendered difficult by adhesions. The parts removed are shown in Figure 376. The left Fallopian tube is six inches long and one inch in diameter; it is thickened and *nodular* owing to invasion by peritheliomatous growth.

Microscopic sections showing perithelioma in the tube, ovary, and round liga-

ment were published in the *Transactions of the Royal Society of Medicine* and in the *Journal of Obstetrics and Gynaecology of the British Empire*.¹ There was no recurrence after two years and seven months, which led Doran to state: "In the whole of my operative experience I never came across a case where the after-history so thoroughly belied operative and pathological evidence."

EMBRYOLOGICAL TUMOURS OF THE TUBE

Teratomata of the Tubes.—Teratomata are rarely found in the Fallopian tube; only six cases appear to have been recorded, and to these I am able to add another from my own collection of museum specimens, this making the third example recorded in Great Britain.

The earliest published case is that of Ritchie² shown at the Obstetrical Society of London on December 6, 1865. The specimen was removed from a lady upon whom Spencer Wells had performed double ovariectomy: the ovarian growths were examined by Ritchie and found to be quite independent of the dermoid in the tube. The latter formed a cyst the size of a plum; it contained four loculi filled with creamy fluid and studded with dendritic growths. There was also a plate of "true bone" one-and-a-half inches long by about half-an-inch broad in the walls of the cyst. The latter occluded the lumen of the tube and was embedded in its walls.

In 1904 Orthmann³ published an important article on embryoma of the tube. After disposing of those cases in which concretions of lime-salts and deposits of fatty matter had been found in the walls of chronically inflamed tubes, he goes on to describe *four* cases of what he considered to be true tubal embryomata. The first was that of Pozzi.⁴ The patient, who was aged thirty-three, had a tubal gestation-sac on the right side, whilst the left tube contained a dermoid tumour in which sebaceous glands, hairs, and adipose tissue, etc., existed. Both ovaries showed small cystic degeneration without any trace of embryomatous structure. The second example was that of Jacobs.⁵ It was removed from a woman aged forty-eight, who for three years had suffered from irregular and painful menstruation. The uterus and appendages were removed for myomata and salpingo-oöphoritis. The left tube at its external end had a rounded tumour containing sebaceous matter and bone. The corresponding ovary contained several small serous cysts, but was otherwise normal. Notto's⁶ case comes third; the patient was aged twenty-five.

¹ *L.s.c.*

² *Trans. Obstet. Soc. Lond.* vol. vii. p. 254.

³ "Über Embryoma Tubae," *Zeitschr. f. Geb. u. Gyn.*, 1904, vol. iv. pt. i. p. 119.

⁴ *Traité de Gynéc. clin. et opérat.* 3rd edition, p. 886.

⁵ Jacobs, *Soc. Belge de Gyn.*, 1899-1900.

⁶ Notto, *Arch. Italiano di Ginecol.*, August 1900, p. 291.

A tumour the size of an orange was diagnosed as an ovarian cyst. It was found to be a pedunculated growth of the tube containing sebaceous material, and sebaceous glands were found developing in the mucosa of the tube.

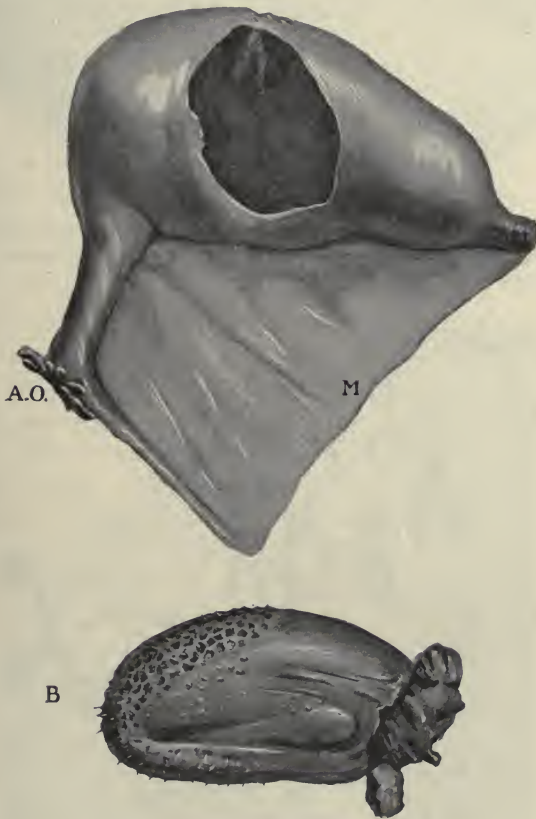


FIG. 377.—Solid teratoma of right Fallopian tube, anterior view.

AO, Abdominal ostium; U, uterine end of tube; M, mesosalpinx. The lower drawing B shows a solid teratoma which was shelled out of an incision made in the tube seen in the upper figure (see also Figs. 378 and 379). At one pole the teratomatous tumour is covered by coarse hair; at the other end there is a kind of pedicle, but the structure lay free in the tube at the time of removal.

Orthmann's own case, published in 1902, was that of a dermoid of the tube containing hair and a tooth which was removed from a woman aged thirty-three who had suffered from pelvic inflammation for several years.

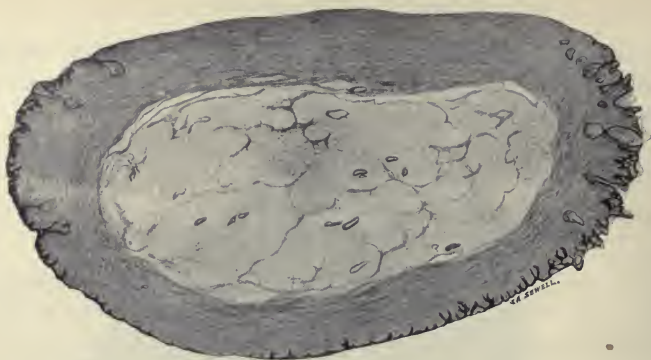


FIG. 378.—Transverse section through the tubal teratoma ($\times 6$) shown in Fig. 377.
The epithelial investment lies upon a zone of dense fibrous tissue, whilst the central core consists only of adipose tissue carrying a few vessels.

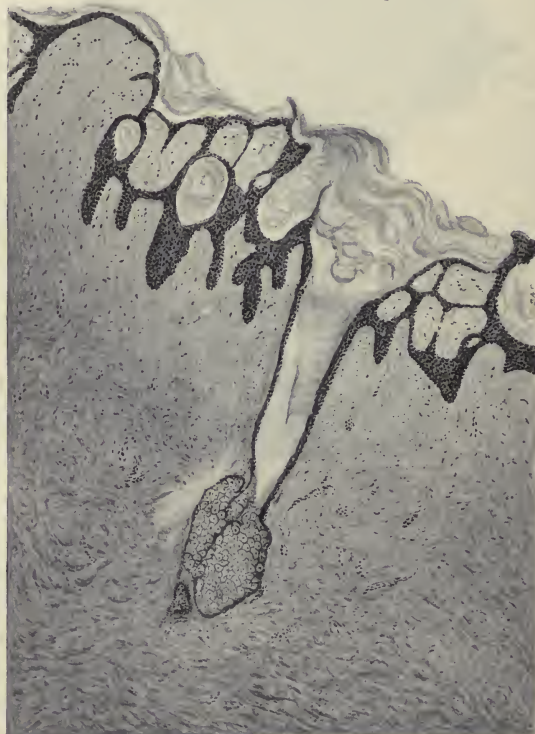


FIG. 379.—Tubal teratoma ($\times 105$) seen in transverse section from the same section as shown in Fig. 378.
A hair follicle and sebaceous gland are seen running down into the fibrous tissue.

In 1912 Nigel Stark reported an interesting case of "dermoid tumour of both Fallopian tubes." The patient was a sterile woman, aged thirty-eight, who suffered from pre-menstrual pain. Ovarian cysts were diagnosed, but both ovaries were found to be healthy at operation. The right tube contained a tumour the size of an orange; the left tube was occupied in its middle part by a growth of smaller size. Each tumour was cystic and contained sebaceous matter, hairs, and bone. The broad ligaments as well as the ovaries were quite healthy.

The specimen of tubal embryoma in my collection was given to me by my late colleague Mr. Butler-Smythe, who removed it from a woman in the Grosvenor Hospital, London, in 1904. The tube itself was dilated and its walls thinned, so that macroscopically it resembled a hydrosalpinx. On opening it up, a curious structure resembling a large cocoon was found lying free in the dilated lumen (see Figs. 377, 378, and 379). On extracting this body, the walls of the empty tubal sac were seen to be semi-transparent and about the thickness of brown paper. The oval body had a narrow projection at one extremity which probably represented a pedicle. The body itself was quite solid and consisted of an envelope composed of skin containing sebaceous glands and hair-follicles. Inside the enveloping dermis the structure was made up of a wide zone of fibrous tissue and a central core of adipose tissue (see Figs. 378 and 379). The clinical history has been lost.

TUMOURS OF FOETAL ORIGIN

Chorionic Carcinoma: Chorionepithelioma of the Tube.—In the Article on Chorionepithelioma in this volume (see pp. 555-593) Teacher states that more than a dozen cases of this disease of the tube have been published. Risel¹ collected ten cases in 1905, and in May 1912² Jeanneret reported eleven cases including his own, and from this list he omitted one recorded by Miles Phillips in 1911. In 1913 the number was brought to fifteen by Zachary Cope and E. H. Kettle. Details of these cases are given by these authors in tabular form, which serve as a valuable table of reference.³

Since the publication of Cope and Kettle's case, at least four others have been

¹ Risel, "Zür Kenntniss der primären Chorionepithelioms der Tube," *Zeitschr. für Geb. u. Gyn.*, 1905, vol. lvi. pt. i. p. 154.

² Lucien Jeanneret, *Rev. méd. de la Suisse romande*, 1912, xxxii. p. 337.

³ "A case of Chorionepithelioma of the Fallopian Tube following extra-uterine Gestation," by V. Zachary Cope, M.D., and E. H. Kettle, M.D. (*Roy. Soc. Med. (Obst. and Gyn. Sect.)*, vol. vi. pt. ii. pp. 247-259).

recorded by (1) Bazy,¹ (2) Rossier,² (3) Huguier and Lorrain,³ (4) Harry J. Hartz.⁴ This makes a total of eighteen cases recorded up to the present time.

Frequency.—In the majority of extra-uterine cases the primary growth is found in the vaginal wall, a few have been situated on the vulva, and four cases of ovarian chorionepitheliomata have been recorded. It would appear that the Fallopian tube comes second only to the vagina, in order of frequency, as a site for extra-uterine primary chorionepithelioma.

Etiology.—(a) *Ectopic Pregnancy.*—It must be assumed that this disease has been preceded by an early ectopic pregnancy. In some cases tubal pregnancy has been proved, e.g. the case of Cope and Kettle and that of Rossier.

In Teacher's series of 188 cases of chorionepitheliomata the disease was preceded by extra-uterine gestation in 7, equalling 4·4 per cent, but this writer does not state that in these seven cases the chorionepithelioma occurred in the Fallopian tubes (see p. 582).

The close association with vesicular mole is well known, but although five cases of this disease occurring in the tube have been reported (Risel), in none of the fifteen cases of chorionepithelioma recorded by Cope and Kettle was there evidence of vesicular mole, nor was there any mention made of the latter in the three additional cases of Bazy, Rossier, or Huguier.

(b) *Embryomata.*—Pick and Klotz suggest an origin from embryomata, but whilst this theory is worthy of some consideration in the etiology of primary ovarian growths, it is highly improbable that it holds good for the tube seeing that tubal embryomata are rarer than tubal chorionepithelioma.

(c) *Deportation of villi.*—It cannot be denied that *deportation of villi* by the blood-stream may occur in the absence of a primary growth in the uterus, but such *deportation* would be most likely to be found in cases of uterine vesicular mole, and this association with tubal chorionepithelioma has not been noted so far as I can discover.

(d) *Devitalization of the Egg-cell.*—Cope and Kettle noted in their case that after the birth of a normal child, an infant was born two years later which survived only seventeen days; then followed another interval of two years when a fleshy mole was expelled. Four years later pregnancy occurred in the tube leading to a

¹ Bazy, "Chorionepithelioma Malignum or Placental Cancer of the Fallopian Tube," *Annales de Gynec. et d'Obstét.*, April 1913, reported in *Journ. Obst. and Gyn. Brit. Emp.*, 1913, vol. xxiii, p. 413.

² Rossier (Lausanne), "Chorionepithelioma of the Tube following Ectopic Pregnancy," *Gynaecologia Helvetica*, 1913, vol. xiii, p. 67. See also Jeanneret (*ibid.*).

³ Huguier et Lorrain, "Chorio-épipithéliome malin de la trompe utérine," *Bull. et mém. de la Soc. Anal. de Paris*, 1913, year 88, No. 7, p. 343.

⁴ Harry J. Hartz, *Surgery, Gynec. and Obstet.*, 1916, vol. xxiii, No. 5, p. 602.

chorionepithelioma in this situation. From these clinical data they advance the improbable theory that a "gradual waning vitality" of the egg-cell may occur, "which culminates in a malignant change of the fertilized ovum."

Signs, Symptoms, and Diagnosis.—The condition has never been diagnosed before operation. The usual signs and symptoms are those of tubal pregnancy with, or without, haematocoele-formation. After symptoms such as amenorrhoea followed by acute abdominal pain, syncope, irregular uterine haemorrhage, etc., have subsided, an abdominal tumour or a mass filling the pouch of Douglas develops. In other cases the disease has been discovered before the formation of a well-marked tumour. Pyosalpinx, ovarian cyst, and salpingo-oöphoritis have all been diagnosed.

Jeanneret writes: "The history generally shows three characteristic stages: *first*, the symptoms of extra-uterine gestation; *secondly*, a latent period; *thirdly*, the stage of rapid development of the tumour, accompanied by abdominal pains and wasting."

Metastases occur with primary tubal, as with uterine growths; in two cases a vaginal nodule appeared early, and in a third, a secondary mass was found in the vagina at autopsy.

Cope and Kettle state that vaginal metastases are less frequent than is the case with primary uterine chorionepithelioma. *Haemoptysis*, pointing to pulmonary metastases, occurred in Miles Phillips' case, but the patient nevertheless recovered.

Local Conditions.—In early cases the tumour has been found to be situated in the isthmic portion of the tube near the uterine cornu. Later on, it is prone to acquire adhesions and to penetrate into the bowel. In Cope and Kettle's case it had penetrated to the submucous tissue of the pelvic colon, whilst in Jeanneret's case (1912) there was a discharge of blood *per rectum*.

In later stages of the disease the growth assumes large dimensions: several of the tumours are described as being the size of an adult head (Bazy, Albert, Senareclens). In consistence and general appearance it resembles that seen in uterine growths; *e.g.* Bazy described the tumour in his case as being soft and as resembling a marine sponge which had soaked up as much blood as it could hold. The softness of the growth may be emphasized by the fact that Bazy noted in five out of nine operations the tumour had to be removed in pieces; total destruction of the tube-wall occurs in these advanced cases. Cystic disease of ovaries has been noted several times (Marchand, Hinz, Risel, Jeanneret, Bazy), but I can find no reference to the co-existence of the compound theca-lutein cysts which, as a bilateral disease, has frequently been recorded as an association of vesicular mole and uterine chorionepithelioma. The history of the growth is similar in every detail to that seen in the primary uterine tumours (see p. 587).

Prognosis.—The outlook is very grave. Cope and Kettle state that out of 14 cases only 2 recovered; Bazy's case died thirty-six hours after operation. A notable exception to the general rule is the case of Miles Phillips, in which, despite clinical evidence of pulmonary invasion, the patient was reported well more than *three years* after a second operation in which the uterus was removed for local recurrence, but an inoperable mass was found at the root of the mesentery.

This exception is quite in keeping with earlier observations—all of which go to show that at times, for reasons unknown, secondary deposits clear up after the primary focus has been removed. Nevertheless this remarkable feature of chorionic carcinoma must be regarded as quite exceptional, it being more usual to find widespread metastases with primary tubal growths. These have been found in the vagina, brain, lungs, spleen, liver, thyroid heart, kidney and suprarenal (V. de Senarclens), and intestine (? continuity).

Treatment.—The fact that chorionepithelioma has been known to disappear should not influence the surgeon. When this disease is situated in the tube, pan-hysterectomy with the removal of both tubes and ovaries is the only safe procedure. Every effort should be made to remove large soft masses as thoroughly as possible by morcellement, free haemorrhage being dealt with by gauze-packing. The profound anaemia should be treated by continuous proctoclysis and if possible by actual transfusion of blood.

EPIBLASTIC TUMOURS OF THE TUBE

I. Innocent: Papilloma of the Tube.—The term *papilloma* was applied by Doran in 1879 "to an exuberant morbid growth which lay in the *interior* of a Fallopian tube," and which the author regarded as of inflammatory origin. Papillomatous growths on the *serous coat* were not included in this class, only those arising primarily from the *mucous membrane* being considered. In the second edition of the *System of Gynaecology*, edited by Allbutt, Playfair, and Eden, 1906, Doran gives an account of his historic specimen, many points of which are here quoted. The patient was a spinster aged fifty; she had been treated by Bickersteth for symptoms of inflammation of the right ovary two years before the removal of the right tube for papilloma. During this interval the right pleura and abdomen were tapped three times for effusion, and, about one month before Spencer Wells removed the tube, the abdomen was tapped a fourth time, 22 pints of ascitic fluid being drawn off. In the latter Doran found clusters of large vacuolated cells of the same type as had been found in the sediment from the pleural fluid. The right Fallopian tube, containing a villous papilloma, was removed by Spencer Wells in April

1879. At the operation the abdomen contained 17 pints of amber-coloured fluid. The most careful search was made for secondary deposits on the peritoneum but none were found. The patient recovered from the operation and four months later suffered from an attack of *dry* pleurisy; she was known to be "in excellent health" in 1902, twenty-three years after operation. A correspondence between Mr. Doran and Mr. Bickersteth, junior, has failed to elicit further information regarding the after-history of this case subsequent to the date given above.

The tumour was the size of a large orange; it is seen together with the right ovary



FIG. 380.—Papilloma of the Fallopian tube. (Doran's First Case.) The tubal wall has been divided along its upper border and turned back, exposing the papillomatous masses springing from the mucous membrane.

1. Uterine end of tube. 2. Bristle in fimbriated extremity of tube. 3. Ovary, which is healthy. A small pedunculated cyst is seen below the tube near the ovary. 4. Wall of tube turned back to show growth in lumen. 5, 5. Masses of papillomatous growth filling outer two-thirds of the tube.

in Figure 380. Doran states that "cauliflower masses sprouted from all parts of the mucous membrane of the tube. The uterine end admitted a bristle which could be passed through the entire tube and out of the ostium." The latter was abnormally patulous, and through the opening issued a thick mucoid fluid.

This interesting and historical specimen is to be seen in the Royal College

of Surgeons of England. It is now placed in the General Neoplasms series [Benign: Papilloma: Mucosal (Villous Type): of Fallopian Tube]. No. 1507, 1. The description in the catalogue is as follows:

"A right Fallopian tube which is much dilated by the growth of a very extensive Papilloma. The tumour has everywhere a surface like such as is met with in papilloma in the urinary bladder, and much of it projects into the cavity in a free condition, its base of attachment being far from general. A black bristle has been passed through the divided uterine end of the tube which for a distance of 2.5 cm. (1 inch) is in every way uninvolved; and a second bristle has been inserted into the abdominal ostium. The exterior of the tube and the ovary are unaffected. Microscopic examination shows the neoplasm to be a Papilloma of somewhat delicate character, the processes of which are invested with columnar epithelium."

The microscopic appearances of the growth are seen in Fig. 381, drawn from a section prepared by R. W. Parker in 1879, and kindly lent to me by Professor Shattock.

Two other simple papillomata of the tube have been reported by Doran,¹ and these specimens are also placed in the Royal College of Surgeons' Museum, Nos. 212 and 213, Series "Injuries and Diseases of the Organs of Generation in the Female," the specimen from the first case having been recently transferred to the "General Neoplasms Series." Specimens II. and III. are a pair of tubes removed by Bantock from a patient suffering from bilateral tubal disease; she was known to be in good health three years after the operation.

Two cases of papilloma have also been described by Bland-Sutton² under the title of 'Adenoma'; commenting on the first one of these cases Bland-Sutton states that the only microscopic difference between it and that of Doran was that there was more connective-tissue stroma in the former than in the latter, but as the patient died, the clinical confirmation of the innocence of the tumour is lacking.

The second case is more interesting, in that Sir John Bland-Sutton informs me that the patient was alive and well in 1915, *i.e.* more than fifteen years after operation.

A well-known case is that of Doléris,³ in which the right tube contained a mass of papillomatous vegetations (see Fig. 382). The patient was a I-para aged twenty-eight years, who had suffered from the effects of gonorrhoea for several years and whose appendages showed signs of chronic inflammation. The specimen shown in Figure 382 was removed by Doléris on July 2, 1889, and the patient, who is now fifty-five years of age, was again operated upon by the same surgeon on June 11,

¹ "Papilloma of both Fallopian Tubes and Ovaries," *Trans. Path. Soc. Lond.*, 1888, vol. xxxix, p. 212.

² *Surgical Diseases of the Ovaries and Fallopian Tubes*, 2nd edition, p. 226 and p. 285.

³ "Papillome endo-salpingitique," *La Gynécologie*, 1898, p. 289; also Macrez, *Des tumeurs papillaires de la trompe de Fallope*, Thèse, Paris, 1899.

1915, for cancer of the cervix and fibromyoma of the body of the uterus. M. Doléris informs me that she was quite well in April 1916. Three other cases, those of Monprofit and Pilliet, and of Chifoliau and Merklen, also a second of Doléris, are mentioned in the thesis by Macrez, making nine in all collected by that author up to May 1899.

Quénu and Longuet¹ mention, in addition to the above, further cases recorded by Schirehoff, Pasteau, and three by Schonheimer, but these authors omitted the case recorded by Clark.² Thus up to 1901 14 cases had been recorded, and two more were added to the list in 1904 by Federow.³ In 1910 Charles Bourrély⁴

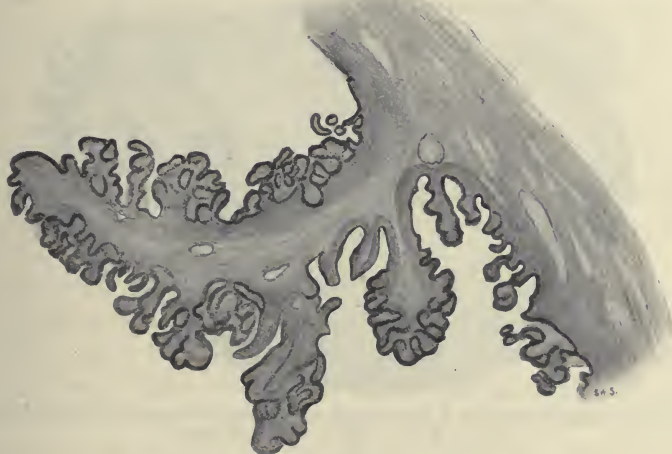


FIG. 381.—Doran's specimen of tubal papilloma. ($\times 80$.)
Drawn from a section of the tube-wall made in 1879 by R. W. Parker. See text.

mentions 3 cases not included in the above series. These are two by Tédenat (papillomata) and one by Neu of Heidelberg (adenoma). Excluding the latter, which seems doubtful, we have 16 cases recorded up to 1910. M. Doléris, in a letter to me, mentions a third case of his own, but I can find no reference to it in the literature.

Etiology.—Doran speaks of papilloma of the tube as “a product of inflammation,” and Macrez⁵ describes a papillomatous endo-salpingitis as a forerunner of

¹ Quénu and Longuet, “Des tumeurs des trompes,” *Revue de Chirurgie*, 1901, vol. xxiv. p. 413.

² J. G. Clark, “Papilloma of Fallopian Tubes,” *Johns Hopkins Bull.*, July 1898.

³ “Corpora libera in tuba Fallopia,” *Annales de Gynéc. et d'Obst.* vol. i., new series, 1904.

⁴ Charles Bourrély, *Tumeurs primitives des trompes*, Thèse, Montpellier, 1910.

⁵ Thèse, *Des tumeurs papillaires de la trompe de Fallope*, Paris, 1899.

a definite papillomatous neoplasm. Quénu and Longuet,¹ Clark, and also Coe² take the same view as does Doran. Clark gives a most careful description of a growth removed by Bayer, which he studied in the laboratory of Chiari in Prague, and states that the specimen supported Doran's view that papilloma of the tube is but the after-result of inflammation, the smaller sessile portions seen on the plicae appearing as examples of simple hyperplasia, and the larger ones being essentially new growths.

Doran, however, thinks that in some instances papilloma may start as a true wart in the absence of inflammation. It is clear that opinion is divided as to whether a preceding salpingitis is essential to the causation of tubal papilloma or of tubal cancer.



FIG. 382.—Dolérís' first case of simple papilloma of the tube (nat. size). (After Macrez.)
Watery fluid escaped in gushes *per vaginam*.

Eckhardt, Tuffier, Witthauer, Vest and others throw doubt on the etiological relationship which is claimed to exist between inflammation and tubal new growths, in spite of the fact that v. Franqué and Lipschitz³ have shown the origin of cancer from tuberculous salpingitis.

I have satisfied myself that *carcinoma tubae* may arise in the displaced epithelium seen in chronic salpingitis, and J. G. Clark has shown papilloma arising from the columnar epithelium of the pseudo-follicles or 'bays,' as he terms them, between adherent mucous folds; that salpingitis is the commonest cause of epithelial neoplasms of the tube I have no doubt whatever. The question arises whether such tumours (either benign or malignant) ever arise in embryonic relics.

¹ *L.s.c.*

² Mann's *Amer. System of Gyn.*, vol. ii. p. 895.

³ "Ein Fall von primären Tubenkarzinom auf dem Boden alter Tuberkulose," *Zeitschr. f. Geb. u. Gyn.*, 1914, xxxix.

Kossmann regards accessory Müllerian tags as not uncommon in connection with the tube, and Stevens has suggested that solid epithelial growths may arise in such structures. I am very sceptical on this point; whilst admitting that such relics account for a variety of *cysts* in connection with the tube, it is highly improbable that they do more than this.

Macroscopic Appearance.—The size of a tubal papilloma as found at operation is variable, and depends not only upon the actual growth, but also upon the amount of fluid which usually accompanies the tumour and assists it in distending the tube. The specimen shown in Figure 380 was described by Doran as being the size of an orange. In Doléris' first case (see Fig. 382) the growth was as large as "a small melon." Sometimes the tube is so cystic as to appear like a hydrosalpinx.

The growth usually occupies the outer two-thirds of the tube leaving a narrow portion comparatively unaltered between it and the uterine cornu. In shape it may be round, elliptical, and, more rarely, lobulated.

Owing to the presence of fluid, parts of the tumour are fluctuant. The tumour is usually enveloped in firm adhesions rendering removal sometimes very difficult. As a rule the tubal swelling lies in the true pelvis, but in Doléris' second case it was found to lie above the pelvic brim, where it was adherent to omentum and coils of intestine.

On cutting into the cystic tumour two types of growth are to be met with; these are described by Macrez as the *villous* and the *papillary*.

The villous type is made up of independent long cylindrical or conical processes with a slender base; they give to the inner aspect of the tube-wall a velvety appearance, and Macrez states that they cannot be confused with hypertrophied plicae.

The papillary type (see Figs. 380 and 382), according to the above authority, is a more advanced stage of the *villous* form; it appears to be the result of peripheral branching of the original slender villous processes, so that a cauliflower appearance is assumed by the growth. Both types may exist in the same tumour, one or the other predominating. The free peripheral portions of a benign papilloma are never necrotic nor ulcerated, as they are liable to be in a *malignant* tubal growth.

The orifices of a tube containing a papilloma may both be closed, the tube forming a cyst. On the other hand, only the abdominal ostium may be patent as in Doran's case, or the uterine end may be patent and the fimbriated extremity closed as in Doléris' Case I. These details are of considerable clinical importance (*vide infra*).

The contained fluid has been studied by Doran, Caton, Macrez and others. It may resemble syrup, liquid gum, or mucus, and is of a pale yellow colour. Doran

detected clusters of cells undergoing vacuolation in the free peritoneal cavity, and the same type of cell was found by Caton in the pleural effusion from the same case. Macrez says that an admixture of blood is a sign of malignancy.

Microscopic Appearance.—The histological characters raise a question of nomenclature. Ought the growth in question to be called a *papilloma* (Doran) or an *adenoma* (Bland-Sutton)? As there are no glands in the normal Müllerian duct, and only pseudo-glands in a chronically inflamed Fallopian tube, the term *papilloma* is in my opinion the more appropriate. The appearances of the growth as seen on microscopic examination are well shown in Figure 381, which is drawn from a section prepared from Doran's Case I. (see Fig. 380). It shows the wall of the tube, from which spring independently several papillae, including one larger than the rest and from which secondary processes or branches arise, the whole system of branches being invested by a single layer of columnar epithelium. Some of the epithelial cells are ciliated, others are non-ciliated. The latter are probably secretive and account for the abundance of secretion accompanying these growths. The wall of the tube is not invaded and the epithelium shows no signs of metaplasia.

Clinical Features.—There is usually, if not always, a history of infection, and this is supported by the signs and symptoms of salpingitis. In Doléris' first case such a history extended over seven years. When an inflamed tube enlarges and becomes adherent, the signs and symptoms will be those of a hydro- or pyosalpinx, and as such many cases of tubal papilloma are regarded. The signs and symptoms of tubal inflammation have already been discussed in the section dealing with this subject (Vol. I. p. 629); it only remains to mention here the features peculiar to their sequela—the tubal papilloma. These are not constant, and their variability in large measure will depend upon the relative patency of the involved tube. If the fimbriated end be closed and the uterine end remain pervious, there may result a flow of mucoid fluid from the vagina (*hydrops tubae profluens*); this was marked in Case I. of Doléris. If, on the other hand, the uterine end be closed and the abdominal ostium remain patent, an escape of fluid may occur into the peritoneum as in Case I. of Doran. This fluid may excite the peritoneum to secrete and set up marked ascites; even pleural effusion may follow (Doran). In such a case emaciation may result even in the absence of malignancy. In a third class of case the tube may be closed at both ends, and a large tubal cyst simulating an ovarian cystoma is then produced. Whatever may be the explanation of pleural effusion in company with benign tubal papilloma, it is clear from Doran's case that it subsided with the removal of the diseased tube, although *dry* pleurisy was afterwards noted.

The explanation of marked ascites is not so difficult. The cells of the growth secrete a mucoid fluid which, when poured out on to the peritoneum, acts as an irritant, causing hypersecretion. The ascitic fluid thus produced provides, according to Pozzi, a means of defence against the irritant which the peritoneum has been unable to shut off by adhesions.

In many cases, however, adhesions are abundant and dense, and no ascites is present. This may be accounted for by a closed ostium, or by the escape of only a limited amount of irritant fluid from the abdominal ostium of the tube.

In cases where the fluid has escaped *per vaginam*, the *intermittent* character of the flow is a fairly constant feature, giving the impression that a certain intra-tubal fluid-pressure is reached, which is then relieved by contractions of the tube.

The escape of fluid *per vaginam* is accompanied by severe *pain* and by a coincident subsidence in the tubal swelling. When the *gushes* of fluid cease the pain subsides. Finally, in *papilloma tubae* there may be no ascites and no escape of fluid *per vaginam*. The absence both of hydroperitoneum and of vaginal discharge was noted in Bland-Sutton's second case, even though the abdominal ostium of the tube was patent. There are therefore no symptoms pathognomonic of this condition.

Prognosis and Treatment.—Although *simple* papilloma undoubtedly occurs in the tube, just as *simple* papilliferous adenoma occurs in the cavity of the uterus, this growth should always be regarded with grave suspicion even in the absence of metastases. As has previously been stated, it is highly probable that the rarity of *innocent* papilloma is accounted for by the relative frequency of *malignant* papilloma. Doran admits the close association when he says: "At any rate, papilloma, whatever it may be, and carcinoma of the tube are inextricably mixed up with each other." Prognosis should therefore be most guarded, and every innocent papilloma looked upon as possessing a malignant tendency.

Treatment.—This should be based on the above considerations. Since it is impossible to be certain in any instance that the tumour is an innocent papilloma, it should *not* be given the benefit of the doubt, but should be treated as if it were undoubtedly malignant, *i.e.* by panhysterectomy and removal of both tubes and ovaries.

II. Malignant: (a) Malignant Papilloma (papillary carcinoma) of the Tube.
Frequency.—The first case of primary cancer of the tube was published by Orthmann¹ in 1888. Doran also published a case a little later in the same year, and this was followed by Kaltenbach's² case in 1889. Sixty-three cases were collected

¹ *Zeitschr. f. Geb. u. Gyn.*, 1888, xi. 212.

² *Centrbl. f. Gynäk.*, 1889, xiii. 74.

by Peham¹ in 1903, 84 by Orthmann² in 1906, 100 by Doran³ and 111 by Bourrély⁴ in 1910, 115 by Anduze-Acher⁵ in 1911, 132 by Cecil Vest⁶ of Baltimore in October 1914.

Other cases have been recorded by von Raabe,⁷ Drutmann,⁸ Lipschitz,⁹ H. R. Spencer¹⁰ (4th case), Russell Andrews¹⁰ (2nd case), and Lady Barrett,¹⁰ making in all 138 cases up to date. Vest states that among over 19,000 patients who have



FIG. 383.—Section from a case of nodular salpingitis showing proliferation and metaplasia of the displaced epithelium (*pre-cancerous condition*). The inset shows the size of the node $\times 2$.

A, Lumen of tube; B, area from which the drawing was made.

passed through the gynaecological wards of the Johns Hopkins Hospital only 4 cases of primary tubal carcinoma have been found.

¹ *Zeitschr. f. Heil.: Abteilung für Chirurgie*, 1903, xxiv, 317.

² *Zeitschr. f. Geb. u. Gyn.*, 1906, lviii, 379-395.

³ *Journ. Obst. Gyn. Brit. Emp.*, 1910, xvii, 1.

⁴ Charles Bourrély, Thèse, Montpellier, 1910.

⁵ Anduze-Acher, *Contribution à l'étude du cancer de la trompe de Fallope*, Thèse, Toulouse, 1911.

⁶ *Bulletin of the Johns Hopkins Hospital*, 1914, 25, p. 305.

⁷ *Beit. z. Geb. u. Gyn.*, 1909, xv, 242.

⁸ *Dissertation*, München, 1913.

⁹ *Monatsschr. f. Geb. u. Gyn.*, 1914, xxxix, 33.

¹⁰ *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, June 1916.

Etiology.—The relationship, if any, which this disease bears to *salpingitis*, *pregnancy*, and *age* has engaged the attention of writers.

1. *Salpingitis*.—Many authorities agree that a pre-existing inflammation acts as a predisposing cause. Säger and Barth (quoted by Doran and by Vest) held the view that tubal cancer is apt to start, after a long lapse of time, generally about the menopause, in tubes which were formerly the seat of chronic, and possibly purulent, salpingitis. The above authors found that in twelve cases of tubal cancer six of the patients were sterile, five bore one child only, and one (Warneck) had two children, followed by a third birth after a lapse of twelve years; these data are stated as confirming the salpingitic origin of tubal cancer (*vide infra*). The histories of recorded cases are too wanting in detail to afford reliable information on which to form an opinion of any value upon this important point.

Doran does not deny that salpingitis may be the origin of cancer, but he states, "I think it conceivable that cancer may develop from the epithelium of the tube independently of inflammatory products or from warts of any type" (see also pp. 745-746). Cecil Vest also concludes "that inflammation of the tubes plays a minor role, if any, in the development of carcinoma of the uterine tubes."

Regarding this question from the point of view of a pathologist, the writer of this article is surprised to find reluctance on the part of clinicians to accept the view that salpingitis is an important predisposing factor to carcinoma. The influence of chronic salpingitis upon the mucosa has been discussed at some length in the article on "Adenomyoma and Malignancy" (p. 368), where it was stated that the displaced (heterotopic) epithelium seen in *salpingitis nodosa* was, according to R. Meyer, never known to become malignant; on the other hand, the picture of metaplasia and proliferation of epithelium presented in cases of chronic salpingitis may be so striking as to render the exclusion of early malignancy extremely difficult and problematical. In fact in a specimen of my own, the proliferation and metaplasia of the epithelium in the displaced follicles was so striking, that Mr. Shattock agrees with me in considering the change as demonstrating a *pre-cancerous condition*. Figure 383 is one of the drawings illustrating this case, which was demonstrated at the Royal Society of Medicine.¹ In 1911 von Franqué demonstrated primary cancer developing in a tuberculous tube, and in 1914 Lipschitz² described a case of primary tubal cancer arising from a focus of caseating tubercle in the right tube. Lady Barrett³ also demonstrated the origin of squamous-celled

¹ *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, June 1916.

² Lipschitz, *Zeitschr. f. Geb. und Gyn.*, 1914, 39, p. 33.

³ *Proc. Roy. Soc. Med. (Obstet. and Gyn. Sect.)*, June 1916.

carcinoma in tuberculous salpingitis at a meeting of the Obstetrical Section of the Royal Society of Medicine, May 1916.

Tubo-ovarian cysts are a product of salpingo-oöphoritis, and these structures have been seen in association with tubal cancer by Pfannenstiel and others.¹ In all, 26 such cases are recorded according to Lipschitz.²

A closed ostium, a thickened uterine end of the tube, the not infrequent association of tubo-ovarian cysts, and the microscopic evidence of chronic inflammation may all be advanced as evidence of a pre-existing salpingitis. On the other hand, the ostium is not invariably closed, in some cases it is blocked by the cancerous growth, and the thickening of the isthmic portion may conceivably be due to an adjacent cancer, so that the question of pre-existing salpingitis must finally be settled by the microscope.

2. *Pregnancy*.—A survey of 62 cases in 1904³ and of another series of 38 cases in 1910⁴ led Doran to the conclusion that parous women are more subject to tubal cancer than are nulliparae, only 8 out of 38 cases in the latter series having been reported as sterile. It will be noticed that these statistics are opposed to those of Sänger mentioned above.

Vest found reference to partity in 112 of his 132 collated records. These showed that 79 women had become pregnant, *i.e.* 70·3 per cent. If it were known what percentage of the *total* female population have become pregnant, we should be able to judge, from the above statistics, whether, or not, pregnancy predisposes to tubal cancer. As no such data are available, there seems to me to be no proof, in the above statement, of an etiological relationship between the gravid state and the disease in question.

It is quite conceivable that *puerperal morbidity*, by causing damage to the tubes, may act as a predisposing factor, and Vest has argued this question from statistics of *one-child sterility*. Of the above 79 parous women he found 32, or 28·4 per cent, bore one child only. This relative sterility he has assumed (for the purposes of his argument) to be due to subsequent infection; which appears to be too big an assumption in the absence of proof. The possibility of intentional prevention, death of the husband, and sundry other causes cannot be excluded. The above author carries his assumption still further by grouping the nulliparae (112 - 79 = 33) with the 32 primiparae to make a total of 65, or 57·7 per cent, "considered sterile from inflammation." No mention is even made of whether these 33 nulliparous women were

¹ Pfannenstiel, "Die Erkrankungen des Eierstocks und des Nebeneierstocks," Veit's *Handbuch der Gynäkologie*, 1898, vol. iii. pt. i.

² Lipschitz, *Zeitschr. f. Geb. und Gyn.*, 1914, 39, p. 33.

³ *Journ. Obst. and Gyn. Brit. Emp.*, 1904, vi. 601.

⁴ *Ibid.*, 1910.

married or single, so the chances are that many were single, others may have been married to impotent or sterile husbands ; the figures given by Vest must therefore be considered inconclusive.

Only in a secondary or indirect way can pregnancy be considered to predispose to tubal cancer, viz. by the risk of salpingitis involved by puerperal sepsis.

3. *Age*.—Doran's statistics and those of Vest show very clearly that primary cancer of the tube is most frequent at and, for a few years, after the menopause. In Vest's tables 53 per cent of all cases occurred between the ages of forty and fifty ; whilst at the two extremes of life, 3 cases occurred between the ages of twenty-seven (Norris¹) and thirty ; 4 between sixty and sixty-five ; and one (Pawlik and Novy²) at seventy years.

Carcinoma of the tube may therefore be expected to occur at the time when malignancy is prone to develop in other parts of the body, the average age in 127 cases being 48·3 years (Vest).

Starting-point.—Primary cancer starts in the *mucosa* of the middle and outer thirds of the tube. In one case, that of Lady Barrett, it started in the isthmic portion, which was the seat of tuberculous salpingitis.

Friedenheim claims to have demonstrated its origin in the *mucosa* of an *accessory* tube. A few authors have suggested that tubal cancer may arise from Wolfian relics, a theoretical assumption which carries no weight, since such structures, if found in the tube at all, would only be present on its isthmic portion, and this part of the tube has, with the above exception, never been shown to be the site of origin of tubal cancer.

Pathology.—Unfortunately there has been much confusion displayed in the classification of tubal cancer, and even Doran includes Gosset's "Perithelioma" (see p. 734) as No. 90 in his series of one hundred primary tubal cancers, and this error has been repeated by Bourrély in his series of 111 cases of tubal cancer. It would be a difficult task critically to review the histology of every reported case, but even if the others are *sans reproche*, Gosset's case at least should be deducted from the 138 cases recorded to date. Another complexity arises from the fact that papillomata appear to be included in the list of cancers, although Doran is careful to eliminate his own case published in 1879 (see Fig. 380), in which the patient was known to be free from a recurrence twenty-three years after operation.

Various classifications have been formulated. Vest cites that of Sänger and Barth as being the oldest. These authors divide cases into (a) Papillary, (b) Papillary alveolar, *i.e.* adenocarcinoma. Falk's classification is : (a) Benign papilloma,

¹ *Surgery, Gynec. and Obst.*, 1909, viii. 272.

² Doran, *Trans. Obst. Soc. Lond.*, 1900, xlii. p. 6.

(b) malignant papilloma, (c) Papillary epithelioma. Lewitsky¹ classified these growths as (1) *carcinoma papillare seu villosum*, (2) *carcinoma alveolare*, (3) *carcinoma mixtum*, the last being the commonest.

I agree with Doran in keeping benign papilloma distinct, and have accordingly adopted the simple division of cancer of the tube into (1) papillary carcinoma (malignant papilloma) and (2) adenocarcinoma (see Figs. 384 and 387).

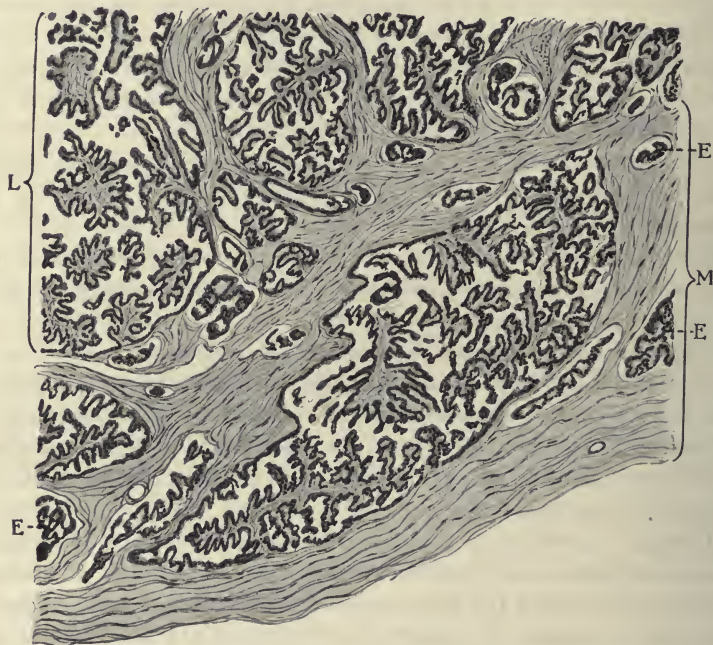


FIG. 384.—Transverse section through a segment of a Fallopian tube ($\times 65$) which was the seat of a large malignant papilloma.

M, Muscularis of tube showing invasion by the growth; L, lumen of the tube; E, epithelium undergoing metaplasia.

(a) **Papillary Carcinoma: Malignant Papilloma.**—It is difficult to arrive at an estimate of the relative frequency of the papillomatous type of tubal cancer. The fact that Doran has found simple papilloma to be rare (see p. 745) does not imply that the malignant papilloma is rare also; on the contrary, the majority of simple

¹ Lewitsky, "Zur Frage des primären Tubencarcinoms," *Zeitschr. für Geb. u. Gyn.*, 1913, Jg. 28, H. 12, S. 1905.

papillomata may become malignant, thus perhaps accounting for the rarity of the innocent form.

In Vest's table of 29 cases of tubal cancer 12 are classed as papillary carcinoma, and 3 others may reasonably be included, making a total of 15. The three cases here added include that of Rossinsky, in which the microscopic diagnosis is given as '*Carcinoma cylindro-cellulare*,' but as the tube was filled with 'papillary growth' the cylindrical cells no doubt belonged to a papillary cancer. The other two additions are those of H. R. Spencer (first case) and of Koenig; both of these are classed simply as 'carcinoma,' but the macroscopic drawing of Spencer's case¹ shows that the ampulla of the tube is the seat of a *papilliferous* growth termed by Spencer 'columnar carcinoma,' whilst Koenig's 'carcinoma' was also a *papillary* growth of large dimensions. Of the remaining fourteen no microscopic examination is given in two, and only 'carcinoma' stated in six. I think it may safely be concluded, therefore, that *malignant papilloma* is a commoner form of tubal cancer than is *adenocarcinoma*.

The macroscopic and microscopic features of *innocent papilloma* have been described (see p. 747); the question of malignancy must, in dubious cases, be settled by microscopic examination and by the subsequent clinical history.

When metastases are found at operation the malignant nature of the growth is no longer a matter of doubt. Histologically, a malignant papilloma shows invasion of the tube-wall by papillary epithelial new-growth (Fig. 384), and also active proliferation and metaplasia of the epithelial investment of the papillae. Areas of necrosis and the presence of cystic collections of fluid are features common to the benign and malignant types; the most reliable evidence of malignancy is the presence of masses of epithelial cells within the fibro-muscular strata of the tube. The type of structure about which doubt as to actual malignancy may arise is shown in Figures 385 and 389.

(b) **Adenocarcinoma of the Tube.**—It has already been stated that papillary carcinoma is more frequent than adenocarcinoma. In Vest's table of 29 cases of malignant tubal growths only 4 were classed as 'adenocarcinoma.' To these may safely be added Spencer's second case,² which Vest classes as 'carcinoma,' and probably those of Tate³ and of Clara Eglington; in the latter some individual cells resembled those of sarcoma—a condition more likely to be found in adenocarcinoma than in malignant papilloma. This makes a possible total of seven adenocarcinomata in 29 cases. Without making a claim to accuracy with respect

¹ *Journ. Obst. Gyn. Brit. Emp.* vol. xvii. p. 30.

² *Journ. Obst. Gyn. Brit. Emp.*, 1910, vol. xvii. p. 37.

³ *Ibid.*

to actual numbers, the above analysis is sufficiently exact to show that papillary carcinoma is *twice as frequent* as adenocarcinoma.

Pathology.—Histologically, adenocarcinoma of the Fallopian tube varies, within wide limits, from a growth of tubular type such as that seen in Figures 386 and 387 to a diffuse spheroidal-celled growth with cells densely packed within large alveolar spaces (Fig. 388).

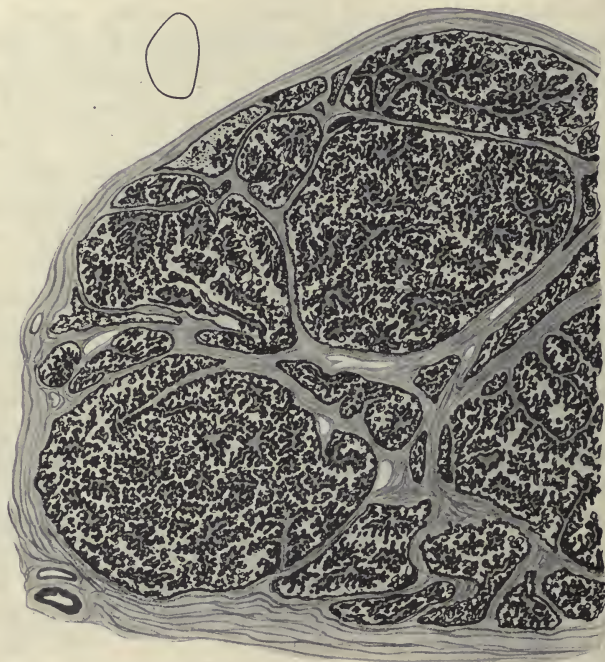


FIG. 385.—Transverse section through Fallopian tube ($\times 65$), showing the lumen filled with papillomatous growth which is probably malignant. The inset shows the size of the tube at the site from which the drawing was made.

In many cases the cells are so atypical as to raise the question of a sarcomatous nature, as, for example, in the case of Clara Eglington,¹ and possibly even in Spencer's third and fourth cases. Perhaps the complex characters presented by adenocarcinoma of the tube are best exemplified in a case recorded by von Franqué² under the title of *Carcino-sarco-endothelioma*.

It is quite possible that some of the few cases classed in this article as 'mixed

¹ *L.s.c.* I have put this case among the possible sarcomata (see p. 732).

² *Zeitschr. f. Geb. u. Gyn.*, 1902, Bd. xlvii. p. 211.

tumours' and as 'sarcomata' are really carcinomata. The case of Clara Eglington¹ has been placed among the carcinomata by Vest, whilst the author herself gets out of the difficulty by describing her specimen as a 'mesothelioma.' Enough has been said to show that cancer of the tube presents many histological difficulties and mixed types are to be expected; in fact, Lewitsky is probably correct in stating that they are more commonly met with than are those which conform solely to *carcinoma papillare* (malignant papilloma) or to *carcinoma alveolare* (adenocarcinoma).



FIG. 386.—Transverse section ($\times 80$) through a Fallopian tube, the seat of primary adenocarcinoma.

M, Muscle-wall invaded by tubules of new growth; L, growth in lumen of the tube; E, epithelium showing active metaplasia.

In endeavouring to arrive at a conclusion as to the nature of a large tubal growth, the wisest plan is to be guided solely by the characters of the growing edge of the new tissue.

If encountered early in the course of the disease distinction in type may be quite definite, as is clearly shown in Figures 387 and 389, but when necrosis and haemorrhagic infiltration have altered the characters of the older parts of a large

¹ *Journ. Obst. Gyn. Brit. Emp.*, 1912, vol. xxi. p. 169.

tumour, it is useless to dogmatize on the histogenesis of such tissues; only the peripheral portions of the growth will reveal true characters.

Naked-eye Appearances of Cancer of the Tube.—The shape assumed by a tube containing a cancerous growth is frequently that of a sausage—a point well illustrated in the case reported by Le Count of a tumour removed by Byrom Robinson, also in Hubert Roberts' first reported case removed by Meredith, and in several others. It may resemble a tobacco pipe (von Franqué's case and H. R. Spencer's first case), or it may be coiled upon itself like a hydrosalpinx.

After removal, the surface is seen to be roughened and shaggy from adhesions, but in a few instances a smooth surface to the tube has been mentioned. Lobulation may or may not be present. The inner third of the tube, being usually unaffected by the growth, appears as a pedicle or stalk to the latter. Several tubal cancers have been regarded as pyosalpinges at the time of operation, and the true nature has only been revealed by incision after removal. In Cullen's¹ large tubal cancer (see Figs. 390 and 391) there was such an abundance of fluid in the tube that in general appearance and contour it closely resembled an ovarian cyst. In some instances a mass of vegetations may project like a rosette through the abdominal ostium.

When a papilloma becomes cancerous there may be nothing in its naked-eye appearance to suffice for the diagnosis of malignancy; in other words, the differentiation can only be made by the microscope.

Adenocarcinoma is lacking in the sprouting cauliflower-masses so characteristic of papilloma. In its gross anatomy it more closely resembles sarcoma, and the contrast between papilloma and adenocarcinoma is well seen by comparing Figures 379 and 381 with Figure 391. In adenocarcinoma, tuberous masses of growth may be seen late in the disease, but the villous appearance produced by the fine branching processes of papillary cancer are absent. Adenocarcinoma presents a smooth yellowish- or whitish-grey appearance on section; the tissue varies in consistence: it may be soft and brain-like, on the other hand it may be quite firm. In both papillary carcinoma and adenocarcinoma necrosis of tissue, and blood-cysts within its substance and in the lumen of the tube, are very common. In each variety of cancer it is common to find both tubes involved; the frequency of bilateral disease is given by Doran as 36 per cent, and he suggests that "in more than one case the disease in the opposite tube was overlooked."

The tumours which have been examined after removal have varied in dimensions from the size of a pigeon's egg to that of a growth examined by myself for

¹ "Carcinoma of the Right Fallopian Tube readily palpable through the Abdomen," *Johns Hopkins Bulletin*, January 1911, vol. xxii.

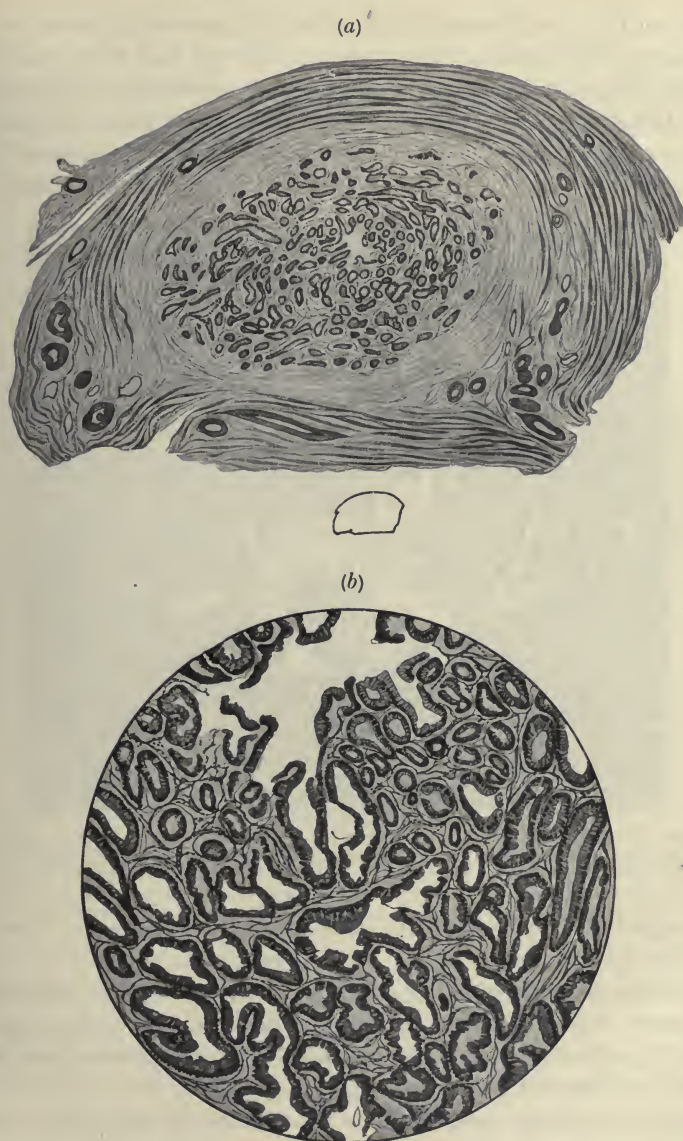


FIG. 387.—(a) An early case of adenocarcinoma of Fallopian tube. Inset, natural size.
(b) Adenocarcinoma of Fallopian tube. Portion of (a). ($\times 65$)

Macnaughton Jones, which measured 10 inches in its greatest by 8 inches in its least circumference. The ampulla of the tube is usually the part to be first attacked. The shape of the tube is maintained until the walls are ruptured by the intratubal masses. The growth erodes the tube-wall until the latter forms a thin investing sac, between which and the tumour may be found haemorrhagic or mucoid fluid pent up in cyst-like spaces. The abdominal ostium is almost always closed by pre-

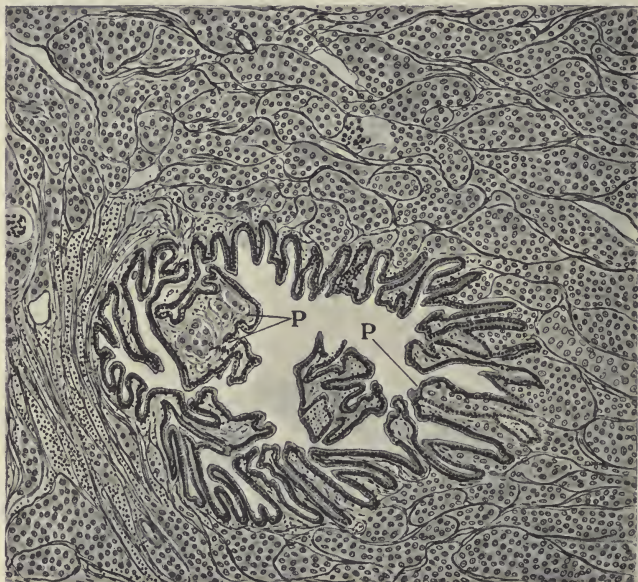


FIG. 388.—Transverse section through a Fallopian tube ($\times 65$), showing alveoli densely packed with spheroidal-shaped carcinomatous cells. The latter also occupy some of the mucosal folds as shown at P and P.

existing inflammation, and the outer surface of the delicate sac is often densely adherent to adjacent structures.

Symptoms.—There is nothing definite in the character of the early symptoms of tubal cancer, and as Vest says, the probable explanation of so many cases being advanced at the time of operation is to be found in the variation and irregularity of the symptoms earlier in the disease.

Among the symptoms mentioned are (1) disorders of menstruation, (2) pain, (3) blood-stained discharge, (4) ascites, (5) wasting and cachexia, (6) the presence of a tumour.

(1) *Menstrual disturbance*.—Many cases occur after the menopause. In those which arise in the fertile period the menstrual history varies greatly, and Doran states that the records are so vague as to be of no value. Vest included menorrhagia and metrorrhagia among the early symptoms, and Danel¹ mentions the case of Hofbauer, in which there was a history of menorrhagia of three years' duration, but he points out that this is not a constant symptom. Dysmenorrhoea is mentioned

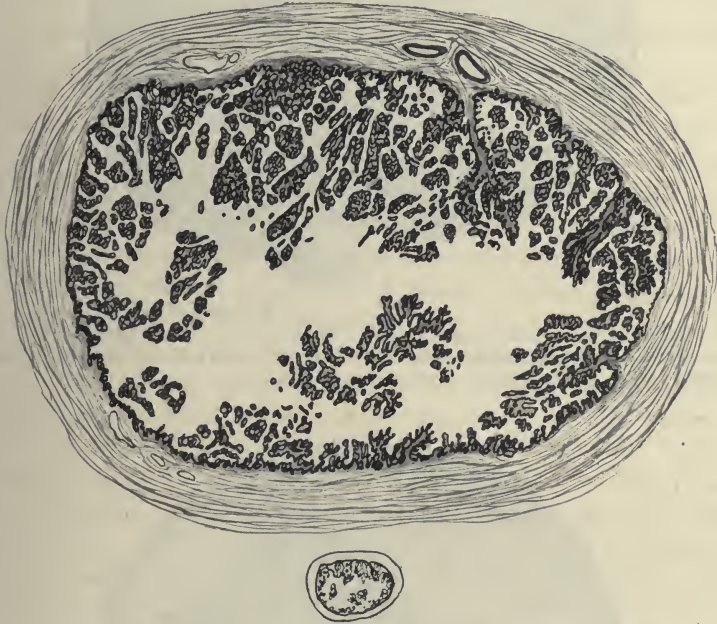


FIG. 389.—Malignant papilloma of the Fallopian tube. Inset, natural size.

This part of the tube shows no invasion of its walls by the new growth, but other sections proved that this had occurred and that there was active epithelial metaplasia present.

as a symptom in some of the recorded cases. In women past the menopause, post-climacteric haemorrhage may be met with in tubal as in uterine cancer.

(2) *Pain*.—This may be confined to the hypogastrium or to one or other of the lower abdominal quadrants. On the other hand it may be general, radiating to the upper abdomen, or down the thighs and legs and to the back. It may be constant and severe, or may occur in attacks or crises resembling, according to Säger, the pain produced by acute torsion of an ovarian cyst, as for example in Hubert Roberts'

¹ L. F. Danel, *Essai sur les tumeurs malignes primitifs de la trompe utérine*, Paris, 1899.

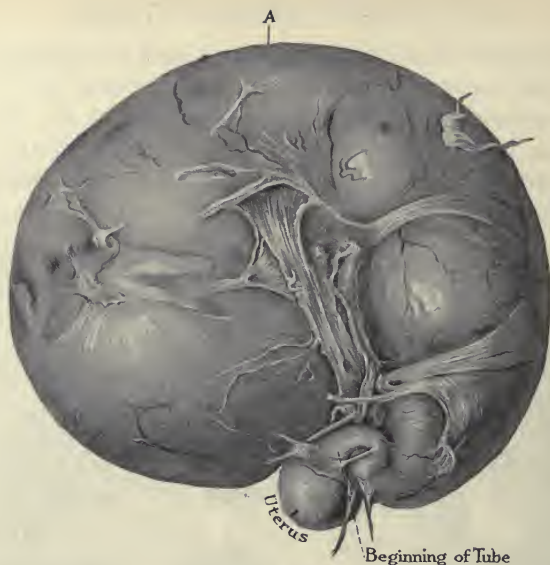


FIG. 390.—Primary carcinoma of the right Fallopian tube. ($\frac{6}{100}$) (After Cullen.)

Note—(1) that the isthmic portion of the tube is free from growth; (2) the adhesions on the surface of the tumour; (3) the general resemblance to an ovarian cyst.



FIG. 391.—Primary adenocarcinoma of the right Fallopian tube. ($\frac{6}{100}$) (After Cullen.)
Hemisection of tumour seen in Figure 390. The great distension of the outer part of the tube is due to serous fluid which has coagulated in the hardening solution.

first case, in which two or three such exacerbations occurred at intervals of three or four months. Both Doran and Danel state that severe attacks of pain occurring, after long intervals, in the subjects of chronic salpingitis, afford evidence in favour of tubal cancer.

(3) *Watery or blood-stained discharge.*—A sanious watery vaginal discharge is the most pathognomonic sign of tubal cancer. It was noted by Doran in 27 per cent of cases. This may occur in profuse *gushes* at long intervals, or it may persist continuously for months in smaller amount. The staining by blood-pigment is not constant. Often the discharge is watery and yellow in colour, or it may be glairy and mucoid. The presence of a *sanious* discharge in the case of a tubal swelling affords suggestive evidence of malignancy, but a discharge which is only *watery* and not sanious is common both to innocent tubal papilloma and carcinoma. There may be a close connection between severe attacks of pain and the emission of profuse sanious discharge *per vaginam*. It was repeatedly noticed in Hubert Roberts' first case that acute abdominal pain was followed by vaginal discharge. The pain may be due to the tubal contractions, which are accountable for the ejection of the intra-tubal fluid through the patent uterine orifice.

(4) *Ascites.*—Fluid in the peritoneal cavity is common in cases of tubal cancer, but it occurs later than in malignant disease of the ovaries. Secondary deposits on the peritoneum is the usual explanation, only in 1 per cent of cases was the *ostium abdominale* patent, allowing the escape of irritant fluid from the tube. This was the prominent feature of case 37 of Doran's tables¹ (Le Count's²), in which there was a patulous tubal ostium, and over two gallons of ascitic fluid escaped at the first operation. Rapid recurrence followed, frequent tapplings were necessary; six months later papillary growths were freely excised, followed by more tapplings for ascitic fluid before death ended the scene fourteen months after the second operation.

(5) *Cachexia and exhaustion.*—These are late symptoms common to malignant disease generally. There is nothing specially characteristic about their appearance in advanced tubal cancer.

(6) *The presence of a tumour.*—In very many cases there is no swelling to be made out *per abdomen*. On the other hand, the tubal growth has been discovered above the pelvic brim embedded in omentum and adherent to intestine. Even *per vaginam* nothing but a distinct resistance in the lateral fornices may be noted, and

¹ "Cancer of the Fallopian Tube," *Journ. Obst. and Gyn. Brit. Emp.* vol. vi.

² Le Count, "The Genesis of Carcinoma of the Fallopian Tube in Hyperplastic Salpingitis," *Johns Hopkins Bulletin*. March 1901.

when ascites is present it may mask the presence of a tubal swelling, as in No. 76 of Doran's series,¹ where the ascites was attributed to cirrhosis of the liver, the patient being of intemperate habits, but the effusion was certainly due to the tubal growth. On the other hand, *per vaginam* unilateral or bilateral (36 per cent) elongated sausage-shaped swellings which are often cystic may be detected in the right and left posterior quadrants of the pelvis. They may be quite fixed by adhesions to the uterus and to the pelvic walls. It may be possible to determine a diminution in size of the tumour, or tumours, after the escape of fluid *per vaginam*, or after the onset of rapid ascites. The naked-eye appearances of the tumour caused by tubal cancer are mentioned on p. 758.

Diagnosis.—There is no symptom-complex sufficiently definite and pathognomonic to render the diagnosis of tubal cancer certain. Presumptive evidence will be based on a history of tubal inflammation, followed by post-climacteric haemorrhage, or by the presence of a sanious watery discharge either intermittent or continuous, and preceded by attacks of pain in the abdomen.

Such evidence is strengthened if, on examination, an elongated or rounded swelling, transmitting a doughy or fluctuating sensation, is felt in one or other posterior quadrant of the pelvis. In cases where the tumour is of firm consistence the differential diagnosis is that of myoma. When markedly cystic, an ovarian cystoma is usually the alternative. Such complications as a coincident uterine myoma, noted nine times by Doran in his series of 100 cases, or an ovarian cyst, noted eleven times in the same series, will enhance the difficulty of diagnosis.

The presence of a tubo-ovarian cyst noted in 26 cases (Lipschitz) may present another difficulty. Finally, as previously stated, no definite swelling, but only a thickening in the fornices, may be detected, and even when the tube is removed, the diagnosis is only made possible by microscopic examination.

Extension and Metastases.—Carcinoma arising in the tubal mucosa invades the muscular wall, and may even rupture the serous coat and spread on to the peritoneum and omentum, as was illustrated in cases recorded by Fischel and by Kiwisch; in the latter's case the tubal rupture was followed by general peritonitis. A relatively frequent direction for the spread of tubal cancer is towards the ovary. Three cases were recorded by Sängner, two by Kundrat, and others have been noted by Cullingworth, Cullen, and von Franqué. As stated above, the opposite tube is implicated in 36 per cent of cases.

The uterine mucosa may become the seat of secondary implantation and the uterine walls may be the seat of lymph-metastases. Extension *via* lymphatics has

¹ *L.s.c.*

led to metastases in the retroperitoneal glands, which was noted in 7 out of 43 cases by Stolz. The inguinal glands were involved in a case recorded by von Rosthorn. Secondary deposits have also been found in the stomach, rectum (Cullen), liver (Westermarck), bladder (Doran), vagina (H. R. Spencer), skin (Barsch), and supra-clavicular region (Rossinsky).

Implantation-metastases have been noted after operation by von Rosthorn and by Osterloh.¹ After removing what he thought was a pyosalpinx Osterloh noted a swelling in the abdominal scar a year later. This proved to be a recurrence from a primary tubal carcinoma.

Prognosis.—This is very largely influenced by the late discovery of the disease, due to the vague and ambiguous character of the early symptoms. In cases operated upon in such early stages as are shown in Figures 387 and 389, the prognosis should be as good as it is in carcinoma of the uterine body. The primary mortality in operation-cases is 6 per cent according to Doran; but as cases are often advanced when operation is performed the after-histories, as a whole, are unsatisfactory. More than 25 per cent of patients die of recurrence between six months or one year after removal of the affected parts (Doran). Five cases of freedom from recurrence are mentioned by Doran²: the first, eight years (Zweifel); the second, seven years (Veit); the third, three years (Dirner and Fonyo); the fourth and fifth, two years and two months (Russell Andrews, Quénu and Longuet). Doran makes the statement that “pathologists must feel sceptical about the malignancy of a tubal tumour when immunity after operation extends over a couple of years.”

Treatment.—Complete extirpation of uterus and appendages should be carried out, and if, as may happen, a tube is removed for what is supposed to be a pyosalpinx and which later proves to be a tubal cancer, the remaining tube and uterus should be extirpated forthwith.

Secondary Tubal Cancer.—The various ways by which cancer may reach the tubes from adjacent or distant organs will now be considered *seriatim*.

1. *By Direct Spread of Cancerous Growth.*—That a spread of carcinoma from the body of the uterus or from the ovary to the tubes may occur has long been known, and until comparatively recent years tubal cancer was always looked upon as secondary to cancer of the other pelvic organs. Tubal carcinoma when secondary to cancer of the uterus or of the ovary occurs, as a rule, in the later stages of the primary disease, and is of more interest anatomically than clinically. The

¹ *Zentrbl. f. Gynäk.*, 1895, p. 924, and 1896, p. 809.

² *System of Gynaecology*, Allbutt, Playfair, and Eden, 1906, p. 514.

spread of cancer to the tube occurs earlier in the progress of ovarian than of uterine cancer.

2. *By the Lymph-stream.*—In 1904¹ I demonstrated the invasion of the tubal lymphatics by cancer-cells in a case of bilateral solid ovarian carcinoma. The tubes were *normal in appearance*, but there was a cyst upon the right tube which I wanted to investigate and which proved to be an accessory hydrosalpinx; but for this, the tubes would probably not have been examined microscopically, as there was no naked-eye evidence that they were the seat of cancer.

Sections of the right Fallopian tube and mesosalpinx showed cancer-cells tracking along the lymph-channels in the connective tissue of the latter, and entering the tube-wall through its mesosalpingeal surface. In the wall of the tube the perivascular lymphatics were blocked with cancer-cells, and the latter were traced into the vessels of the plicae right up to their tips, but the tubal mucosa was everywhere intact, as also was the peritoneal coat.

Some months after operation the patient died, and opportunity was afforded of examining the uterus; it was then found that, by lymphatic spread, the growth had reached the uterine wall, but the cancer-cells had not extended as far as the endometrium, this membrane appearing quite normal. Since the above case was published similar observations have been made by Landerer and by Orthmann, but in Landerer's case the tube-walls were thickened and in Orthmann's case there was a carcinomatous nodule at the fimbriated extremity. The clinical importance of finding *apparently normal tubes* infiltrated with cancer, in cases of bilateral ovarian carcinoma, cannot be overstated; it clearly shows the need for hysterectomy in these cases, since it is impossible to tell, by naked-eye examination, whether the tubes and the uterine wall are involved or not.

3. *By the Blood-stream.*—This mode of invasion of the tube is purely hypothetical. There is no authentic instance of cancerous emboli being found in the arteries or veins within the tube-wall.

4. *By Implantation.*—Implantation is a common mode of involvement. It may occur either upon the *serous* or upon the *mucous* coat of the tube.

The *serous* coat may be involved as part of a general peritoneal spread of cancer, the primary seat being in the ovaries, or in the stomach, omentum, bowel, and more rarely in the uterus. This type of tubal cancer is of no clinical significance, the implication of the tubes being part of a general process. The naked-eye appearances of the tubes vary considerably; the cancerous growth may be distributed as small nodules the size of millet seeds, and bearing a superficial resemblance to

¹ *Trans. Obstet. Soc. Lond.* vol. xlv. pp. 229-234.

tuberculous peritonitis, or discrete masses of cancer may exist, here and there, with wide intervals of fairly healthy peritoneum intervening. In one of my cases of bilateral ovarian carcinoma, a mass of cancerous tissue was suspended from the fimbriae of the tube as a pedunculated growth. Once cancer is implanted on the tubal serosa it can penetrate the peritoneal epithelium (endothelium) and invade the muscular coats right down to the mucosa, as was proved in a case recorded by Kundrat.¹

Implantation upon the *mucosa* of the tube has been noted by many observers, and cancer-cells lying free in the lumen of the tube have been demonstrated by

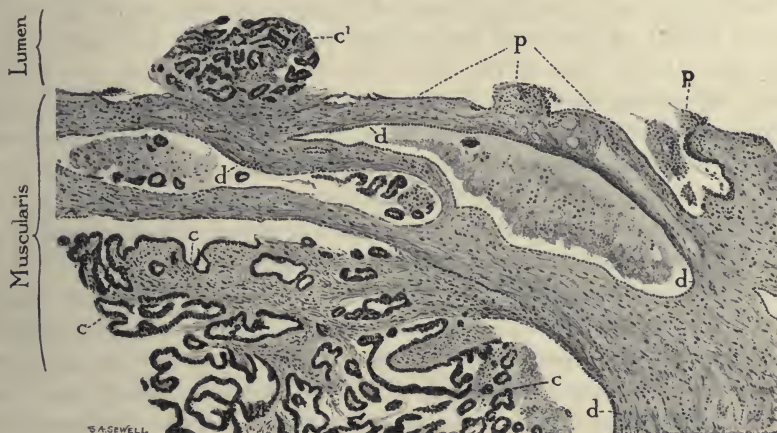


FIG. 392.—Longitudinal section through the wall of the right Fallopian tube. ($\times 105$.)

The lumen of tube contains a nodule of cancerous tissue, *c*¹, lying on bare muscle, the mucous membrane being destroyed at this spot. *p*, Plicae flattened out and fused to form follicles; *c*, mass of cancerous growth in a large follicle lying in the muscular wall of the tube; *d*, epithelial lining of follicles.

Koblanc and by Glendining. The latter observer takes the view that cancer-cells pass through the columnar epithelium of the tubal mucosa and implant themselves in the subjacent structures, just as Kundrat has shown they may enter the peritoneal coat and invade the muscle from without. Writing six years after the publication of my work on the lymphatic spread of ovarian cancer, Glendining, without making specific reference to my paper, questions the lymphatic spread of cancer from ovary to tube because *he* has "never found them (cancer-cells) to extend back into the mesosalpinx and tissues of the Fallopian tube."²

In his concluding remarks Glendining only admits as proved *one* mode of

¹ *Archiv f. Gynäk.* Bd. lxxx., 1906.

² *Journ. Obst. and Gyn. Brit. Emp.* vol. xvii. pp. 28-29.

invasion of the tube-walls, viz. the engrafting of cancer-cells on the mucosa and subsequent penetration, but he grudgingly allows the *possibility* "of lymphatic permeation from ovarian growths." A review of the literature shows that *mucosal implantation* is far more common than *lymphatic permeation*. The most remarkable case of mucosal implantation which I have encountered is one in which a patient aged fifty-nine years, who had been known to have a myomatous uterus for many years, developed an *endocervical* cancer. I removed the uterus and appendages. On the left was a pyosalpinx and pyocele, on the right a thin-walled ovarian cyst with one metastatic deposit the size of an almond on its surface; the right tube was thickened but patulous. The mucosa of the right tube was studded by pinkish glistening nodules of carcinoma, the microscopic characters of which are seen in Figure 392. On the back of the uterus were many sessile plaques of cancerous deposit. On opening the corpus uteri after it had been hardened, the cancer was seen to have spread over the whole of the endometrium, so that the entire genital tract from the cervix, where the disease arose, to the peritoneum was implicated by the growth.

I have found but one other case of carcinoma of the tube and ovary secondary to cancer of the cervix; this was published by Taussig in 1907.¹

Kroemer² has drawn attention to the relative frequency of tubal carcinoma in tubo-ovarian cysts, and he has recorded three examples. It is often difficult to decide whether the cancer started in the ovary or in the tube in such cases. Especially is this the case in *papillary* growths, since there is the closest resemblance between papillary tubal cancer and malignant papilliferous ovarian cysts. Secondary tubal cancer is more commonly a sequel of ovarian than of uterine carcinoma, in spite of the fact that Sanger held the opposite view. When secondary to a uterine growth, the latter is practically always found as a primary *corporeal* cancer. Kundrat examined the tubes in 80 cases of *cervical* cancer and in 24 cases of *corporeal* carcinoma. No tubal metastases were found in the first series, whilst in the latter three instances of tubal invasion were discovered.

¹ *Surgery, Gyn. and Obstet.* vol. v. No. 5.

² *Monatsschr. f. Geb. und Gyn.* Bd. xxii., 1905.

TUMOURS OF THE OVARY

By HERBERT WILLIAMSON, M.B., and J. D. BARRIS, M.B.
(London)

Classification.—We can divide tumours of the ovary into certain broad groups, but when we attempt a scientific classification we are met with difficulties which in the present state of our knowledge it is impossible to overcome. Innocent growths pass by almost imperceptible gradations into malignant; solid tumours develop cysts, cystic tumours contain solid masses, and papillomatous growths are found both within cysts and growing from the surface of the ovary. The same tumour may contain teratomatous, adenomatous, papillomatous, carcinomatous, and sarcomatous elements. Further, it is often impossible to define from what physiological prototype a given tumour has its origin and, as will appear in the course of the article, even when the type of cell composing the tumour is apparently distinctive, its histogenesis may still be in dispute. We shall describe the following groups of tumours :

INNOCENT TUMOURS

Tumours of Epithelial Origin.

Tumours arising from the Gräafian Follicle :

- (a) Distension cysts (Hydrops Follicularis).
- (b) Lutein cysts.

Cysts arising from down-growths of the surface-epithelium, from cell-rests, or from vestigial remains :

- (a) Simple proliferative serous cysts.
- (b) Pseudo-mucinous cyst-adenomata.
- (c) Serous cyst-adenomata.
- (d) Papillomatous tumours.

Teratomata.

Tubo-ovarian cysts.

Broad-ligament cysts.

(a) Fimbrial cysts.

(b) Parovarian cysts.

(c) Cysts of the Hydatid of Morgagni.

(d) Hydrosalpinx of an accessory Fallopian tube.

Tumours of Connective-Tissue Origin.

Fibromata.

Myomata and Fibromyomata.

Mixed Connective-Tissue and Epithelial Tumours.

Fibro-adenomata.

MALIGNANT TUMOURS

Carcinomata.

Solid carcinomata.

Cystic carcinomata.

Malignant teratomata.

Carcinoma composed of tissue resembling that of the thyroid gland.

Neuro-epithelioma.

Chorionepithelioma.

Sarcomata.

Round-celled sarcoma.

Spindle-celled sarcoma.

Mixed-cell sarcoma.

Melanotic sarcoma.

Endothelioma and perithelioma.

Combined Sarcoma and Carcinoma.

Malignant tumours composed of cells resembling those of the corpus luteum.

INNOCENT TUMOURS OF THE OVARY

Distension Cysts (Hydrops Follicularis)

As a Gräafian follicle ripens, it forms for a time a small translucent cyst projecting from the surface of the ovary; under physiological conditions the cyst speedily ruptures and the ovum is discharged. If for any reason rupture of the ripe follicle-wall is prevented, changes, the result of degeneration, become manifest in both the ovum and the cells of the membrana granulosa, the amount of liquor folliculi is increased,

and a simple distension cyst is produced. It is difficult to say where the physiological process ends and pathological change begins. We have no means of determining the maximum size a normal follicle can attain, but if we adopt as the criterion the presence of a healthy ovum surrounded by its discus proligerus, follicles measuring more than 1.5 cm. in diameter must be regarded as pathological, for even when such cysts are cut in serial section an ovum cannot be discovered.

Distension cysts are found frequently at operation and in the *post-mortem* room as thin-walled translucent vesicles projecting from the surface of the ovary and seldom measuring more than 3 cm. in diameter. They may be single or multiple, and, by absorption of the septa between them, multiple cysts may become merged into one.

The cyst-wall is composed of connective tissue, the outer layer is dense and fibrous, the inner cellular and more vascular: the smaller cysts are lined by a single layer of columnar or cubical epithelium, but in the larger cysts the cells are flattened and eventually destroyed by increasing pressure of the fluid contents upon the walls. The intra-cystic fluid is derived partly from degeneration of the cells of the membrana granulosa and partly from transudation through the vessel walls; it is of a pale yellow colour, of low specific gravity, and contains albumen, salts, and nitrogenous extractives. When several follicles undergo simultaneous cystic change the ovary is converted into a tumour consisting of a number of cysts divided by septa of ovarian stroma (Rokitansky's tumour) (Fig. 393).

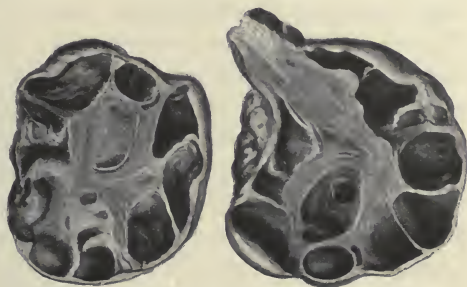


FIG. 393.—Distension cysts (Hydrops Follicularis). (St. Bartholomew's Hospital Museum, Specimen No. 2908.)

The normal rupture of a follicle may be prevented by an unusually resistant theca or a thickened tunica albuginea, and it is noteworthy that the stroma surrounding a distension cyst is often fibrous and shows hyaline change. In spite of the absence of small-celled infiltration it is possible that these changes are a result of previous inflammation, for the surface of the ovary is sometimes covered by adhesions. This view of the origin of these cysts is by no means proved. Nagel maintains that the so-called follicular degeneration is a physiological phenomenon and depends upon the fact that the ovary contains a number of ripe follicles; he states that ova can always be found in the smaller cysts, and that the larger ones arise either from corpora lutea or from inclusions of germinal epithelium within the ovarian stroma.

Clinical Characters.—Follicular distension cysts may be found at any period of life prior to the climacteric: we have found them in foetuses of seven months' gestation. They do not cause symptoms or interfere with the functions of the ovary; menstruation, ovulation, and pregnancy are not affected by their presence. The cysts may rupture and undergo spontaneous cure.¹

Lutein Cysts

Lutein cysts are distinguished by the presence of a layer of yellow lutein tissue in their walls; they are usually single but sometimes multiple. The individual cysts are seldom larger than a golf-ball but the ovary may form a considerable tumour from the presence of a number of such cysts, and in exceptional cases a single cyst attains large dimensions. The appearance presented varies; in some cases the walls are thin and almost translucent, in others thick and opaque (Fig. 394). The contents may be jelly-like but usually consist of clear limpid fluid sometimes coloured from admixture with blood-pigments. On microscopical examination the outer layer of the wall is composed of modified and compressed ovarian stroma, whilst the inner layer possesses a wavy folded appearance, and contains the lutein tissue. Some of the cysts possess a lining of epithelial cells, in others this is absent. When present the epithelium consists of a single row of cells, cylindrical, cubical, or polyhedral, resting upon the yellow lutein stratum (Fig. 395). When there is no epithelial layer the cyst is lined by structureless fibrinous material, probably representing the hypertrophied membrana propria of the Gräafian follicle, or by loose reticulated connective tissue which sends out processes amongst the lutein cells.

Pathology.—Our knowledge of the origin of lutein cysts is very incomplete. They must be regarded essentially as retention cysts whose fluid contents are formed partly by the secretions of the lutein cells and partly by the exudation of serum from the vessels of the zona vasculosa which surround the follicle. In the smaller tumours a granular *débris* is often found composed of lutein cells in a condition of advanced fatty degeneration, of blood-corpuscles, and of fibrin-like material. It is probable that the formation of the smaller cysts is preceded by haemorrhage into the follicles which in some way leads to an excessive production of lutein tissue, and that subsequently the follicle is distended mainly by fluid secretion from the lutein cells themselves. The origin of the lutein cell is still in doubt; many histologists regard them as derivatives of the membrana granulosa, but it is more probable

¹ Gebhard, *Pathologische Anatomie der weiblichen Sexualorgane*, Hirzel, Leipzig, 1899; Nagel, "Das menschliche Ei," *Archiv für mikros. Anat.* Bd. xxxi.; Nagel, "Beitrag zur Anatomie gesunder und kranker Ovarien," *Archiv für Gynäkol.*, 1887, Bd. xxxi. p. 327; Findley, "Cystic Degeneration of the Ovary: an Anatomical and Clinical Study of 180 Cases," *Amer. Journ. of Obstetrics*, June 1904.



FIG. 394.—Lutein cysts of both ovaries associated with chorionepithelioma of the uterus.
(Museum of St. Bartholomew's Hospital, Specimen No. 3014 D.)

that they arise from the cells of the theca interna. It has been established by many workers that lutein cells in frozen sections stain with Sudan iii; Gordon Ley has shown that this property is possessed also by cells of the theca interna but not by those of the membrana granulosa, and concludes that the former are to be regarded as the pre-lutein cells.

The larger bilateral cysts are always associated with a recent pregnancy and in the majority of cases with a vesicular mole or chorionepithelioma; thus of

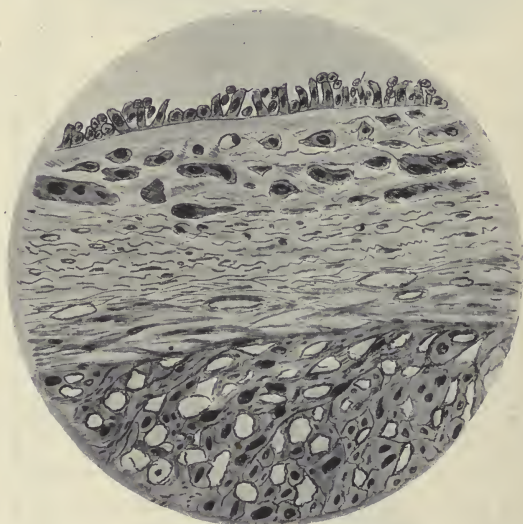


FIG. 393.—Lutein cyst, showing a lining of columnar epithelium. (Lockyer.)

Patellini's 84 cases, in 44 the uterus contained a vesicular mole not followed by chorionepithelioma, in 18 a vesicular mole followed by chorionepithelioma, and in 22 chorionepithelioma developed after an abortion.

In vesicular mole and chorionepithelioma there is a marked hypertrophy of the tissues derived from the trophoblast (the syncytium and Langhans' cells), and it has been suggested that these lesions may result from an excessive production of lutein tissue in the ovary. Such a causal relationship is, however, by no means proved, and it may be that some stimulus, at present unknown, leads simultaneously to hyperplasia of the trophoblast in the uterus and the lutein tissues in the ovary.

Natural History of Lutein Cysts.—Under physiological conditions the life of the lutein cell is a brief one, and in cases where the expulsion of the vesicular mole

is not followed by the development of chorionepithelioma the enlarged ovary gradually shrinks until it again reaches its normal size ; such cases have been recorded by Russell Andrews and Albert.

Simple Proliferative Serous Cysts (Cystoma Serosum Simplex)

Except that they attain a larger size, these tumours differ but little in their clinical features from the follicular distension cysts previously described, and by some pathologists they are classed with the latter. There can be little doubt, however, that they are essentially new growths and arise from an active proliferation of epithelium ; they therefore belong to the group of adenomata and are of special interest in that they represent the simplest type of this tumour-group.

Proliferation of the epithelium though definite is but little marked ; its secretory activity

on the contrary is great, consequently the cysts are distinguished by the relatively large amount of fluid they contain and the scanty amount of epithelium lining their wall. As more fluid is secreted the tumour enlarges, the walls are stretched, and cell-proliferation is sufficiently active to provide them with a complete epithelial investment : epithelial buds and small papillary projections are sometimes seen (Fig. 396).

The tumours are seldom sufficiently large to cause symptoms but frequently attain the size of an orange and occasionally reach much greater dimensions ; they are usually unilocular but are sometimes divided by septa into two or three loculi. The wall is thin, translucent, and of a dead white colour ; in the smaller cysts the remains of the ovary flattened on the surface of the tumour can sometimes be distinguished, but in larger cysts all traces of it have disappeared. The cyst-content is a clear serous fluid of low specific gravity containing albumen and salts.

Microscopic sections show an outer covering of cuboidal cells—the surface-epithelium of the ovary—a middle layer of fibrous tissue containing only few nuclei, and an inner lining of columnar, cubical, or (if the contained fluid has exerted much



FIG. 396.—Cystoma serosum simplex.
(St. Bartholomew's Hospital Museum, No. 2904 F.)

pressure upon the walls) flattened epithelium, usually single-layered but sometimes with proliferating buds (Fig. 397).

The tumours grow slowly, they may remain stationary for a considerable period,

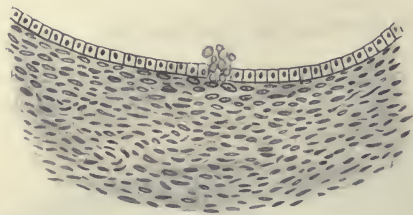


FIG. 397.—Cystoma serosum simplex. Microscopic section showing proliferation of epithelium.

and have been observed to diminish in size from absorption of the contained fluid. They may rupture either spontaneously or as the result of trauma, but the escape of their contents into the peritoneal cavity gives rise to no symptoms and spontaneous cure follows the rupture. There is no known instance of such a tumour developing malignant characters.

It is often asserted that these tumours arise from Gräafian follicles, but such statements are probably incorrect. V. Kahlden¹ has shown that vestigial structures are frequently found in apparently healthy ovaries: these structures are derived from cells of Pflüger's columns which have failed to develop into normal follicles, and it is probable that these tumours develop from such cell-rests.

Pseudo-mucinous Cyst-adenoma

This is the variety of ovarian tumour most commonly met with clinically. It is an innocent growth and is usually pedunculated; more rarely it burrows between, and separates, the two layers of the broad ligament.

Morbid Anatomy.—These tumours sometimes attain an enormous size; one weighing 166 pounds is preserved in the museum of St. Thomas's Hospital. They are rounded, the surface of a dead white colour and exhibiting smooth elevations corresponding to loculi or collections of loculi in the interior of the cyst. Over these eminences the wall may be thin and almost translucent. The vascular supply is rich and numbers of large blue veins are seen shining through the smooth outer wall. On section, we find a number of loculi bounded by fibrous-tissue septa to which clusters of daughter-cysts are attached (Fig. 398). The amount of solid matter varies; in some specimens the whole tumour consists of a honeycomb-like mass with larger or smaller cavities (Fig. 399). Such an appearance is, however, exceptional, and we usually find a few large loculi containing a quantity of thick glairy fluid. The larger cavities are formed by rupture of the walls of smaller cysts so that many loculi, originally separate, communicate with one another by larger or smaller openings in

¹ V. Kahlden, *Über die Entstehung einfacher Ovarialcysten*. Fischer, Jena, 1899.



FIG. 398.—Pseudo-mucinous cyst-adenoma.
(St. Bartholomew's Hospital Museum, No. 2904 B.)

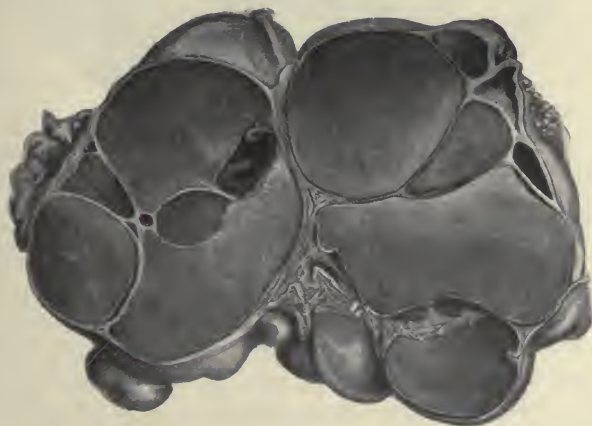


FIG. 399.—Pseudo-mucinous cyst-adenoma.
(St. Bartholomew's Hospital Museum, No. 2904 P.)

the septa ; it is not uncommon to find the remains of the septa flattened and compressed against the inner surface of the cyst-wall. The process may go on to an extreme degree so that the tumour becomes surgically unilocular, and its original multilocular character is revealed only by the presence of fibrous bands or cords on the inner aspect of the wall.

On microscopical examination we find the wall composed mainly of fibrous tissue. The surface is covered originally by the surface-epithelium of the ovary,

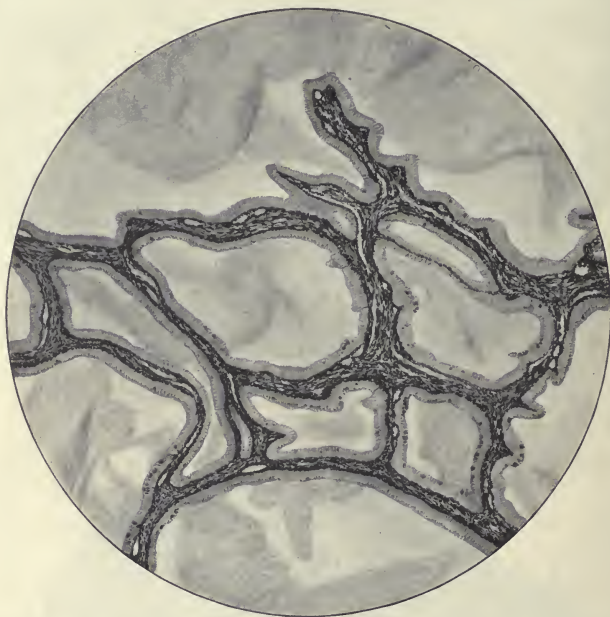


FIG. 400.—Microscopical section through the wall of a pseudo-mucinous cyst-adenoma.

but as the tumour enlarges the epithelial covering is lost and the outer layer of the cyst-wall represents the stretched tunica albuginea. The outer layers of the wall are dense and fibrous, the inner more loosely woven, cellular, and vascular. In the smaller tumours the tissues of the wall resemble those of the stroma of the ovary, but as the wall becomes more and more stretched the resemblance is lost. Glandular depressions lined by columnar epithelium are found in the wall. The cyst is lined by tall columnar epithelium, each cell possessing a rounded nucleus situate near its base (Fig. 400). The cell-protoplasm is not homogeneous ; the portion nearer the base contains albuminous granules whilst the central portion is clear and contains the

pseudo-mucin. Many goblet-cells are present. The cylindrical cells may become cubical or flattened from pressure of the contained fluid.

The epithelium is usually single-layered, but sometimes papillary processes project into the cyst cavities. They are most often found in cysts composed of several loculi of equal size which tend to burrow between the two layers of the broad ligament. The papillae are slender, branching feathery processes consisting of a central stroma of delicate connective tissue covered by a layer of cylindrical non-ciliated cells. Such papillae arise from a rapid proliferation of the lining epithelium. A small bud of young epithelial cells forms a projection into the interior of the cyst; later the stroma accompanied by loops of blood-vessels grows into the centre of the bud. Some authors regard these papillary pseudo-mucinous cysts as a distinct variety. The term 'everting cyst-adenoma' is applied to tumours in which new cysts develop in the wall of the mother-cyst, and 'inverting cyst-adenoma' to those in which papillary processes project into the cavity. The difference between the two types probably depends upon the rate of epithelial proliferation: if the proliferation be rapid the inverting type predominates, if more slow the everting type. It has been suggested that intra-cystic pressure is a factor of importance, that the everting type is formed when this is high, and the inverting type when it is low: clinical observation does not support this view.

Occasionally a pseudo-mucinous cyst-adenoma is lobulated, and in extreme cases the tumour is composed of a number of pedunculated cysts of varying size attached by narrow pedicles to the ovary. Such a tumour is known as a 'grape-like cyst' or 'cluster-cyst.' Pfannenstiel believes that cluster-cysts develop from Wolffian rests, Gebhard maintains that they represent originally separate cysts, and Hertzler suggests that they are formed by excessive eversion of daughter-cysts in which the pedicles attaching them to a common base alone remain and the primary cyst-wall has disappeared.

The fluid contained in ovarian cysts varies in its characters; generally speaking, it is thinner in the larger than in the smaller loculi. It is sometimes so thick and viscid that it cannot be made to flow through a trocar, in other cases it is thin and watery. It usually contains large quantities of ropy mucus. The specific gravity varies between 1010 and 1030. The colour depends to a great extent upon admixture of the cyst contents with blood-pigment and may be yellow, green, red, or dark brown. On microscopical examination we find desquamated epithelial cells, and larger cells filled with yellow pigment. In pre-antiseptic days, when laparotomy was attended by the gravest risks, great importance was attached to the microscopical examination of fluid removed from the abdomen by tapping, and the presence of 'ovarian

cells' and 'compound granular corpuscles' was regarded as decisive in determining the presence of an ovarian cyst. The fluid is derived mainly by a process of secretion from the cells of the epithelium lining the cyst, but partly also by exudation of serum from the vessel walls. It contains albumen and large quantities of pseudo-mucin, a body which can be split up into a carbohydrate and a proteid by boiling with mineral acids but differs from mucin in that it is not precipitated from a watery solution by acetic acid.

Serous Cyst-adenomata.—These are much rarer tumours. They are pedunculated and multilocular but usually consist of only few loculi. They grow slowly and seldom attain a large size. They differ from the pseudo-mucinous tumour in two respects: (1) they are lined by tall columnar cells possessing well-marked cilia, (2) their contents consist of clear yellow fluid containing albumen *but no pseudo-mucin*. From the nature of the contained fluid, from the character of their epithelium, and from the resemblance the tumours bear to certain broad-ligament cysts it is possible that they are derived from Wolffian or Müllerian rests. This question will be discussed later.

The Pedicle of the Cyst.—The cyst-adenomata usually possess a well-marked pedicle composed of the broad ligament, ovarian ligament, and Fallopian tube; in the pedicle branches of the ovarian artery pass to the tumour. More rarely the cysts are intraligamentous, that is they grow between the two layers of the broad ligament, and by stripping up the peritoneum from the posterior wall of the pelvis may become retroperitoneal. In such cases the ureter may be closely adherent to the wall of the cyst and is liable to injury during removal.

Age.—Cyst-adenomata occur at all periods of life. They are commonest between the ages of puberty and the menopause. In the foetus they may attain a size sufficient to cause obstruction to delivery, and they are met with in women of advanced age.

Rate of Growth.—The pseudo-mucinous tumours often grow very rapidly and may attain a large size within a few months. The serous cyst-adenomata grow more slowly.

Malignancy and Metastases.—Malignant invasion of the fibrous wall by the lining epithelial cells is sometimes found in multilocular cysts. Such tumours must be classed as carcinomata; the question as to whether they were malignant *ab initio*, or whether they were originally innocent and have subsequently undergone a malignant change will be discussed later. More rarely sarcomatous tissue may be

found in the wall of the cyst; a number of such cases have been collected by Taylor.¹

Epithelial Infection.—The phenomenon of epithelial infection is occasionally exhibited by pseudo-mucinous cysts. As the result of rupture of the cyst, detached portions of epithelium may become implanted upon a peritoneal surface or upon the raw tissues of a wound and there grow, reproducing in their growth the characters of the parent cyst. These secondary growths, however, are not malignant; they do not invade and destroy the tissues upon which they have become implanted; they persist merely as surface-growths, and in course of time may become smaller and ultimately disappear. In some of these cases masses of pseudo-mucin weighing as much as forty pounds have been removed from the peritoneal cavity, and repeated operations extending over a period of years have had to be undertaken. Hirst² has recorded an interesting example. On opening the abdomen of a woman, aged 50, to perform the operation of ventral fixation of the uterus, a mass of pseudo-mucin, weighing fifteen pounds, was found free in the peritoneal cavity, and in the situation of the left ovary was a pseudo-mucinous cyst-adenoma perforated and collapsed. "Two typical daughter-cysts, the size of a cherry, were found in the wall of the ileum; one exhibited a spontaneous perforation of its wall through which clear pseudo-mucin was oozing." The presence of the pseudo-mucinous masses in the peritoneal cavity may produce a form of chronic inflammation leading to great thickening of the peritoneum and omentum; this condition is known as 'pseudo-myxoma peritonei.'

Pseudo-myxoma peritonei is in most cases associated with ovarian cysts, but twelve cases, the majority in males, have been recorded following mucous cysts of the vermiform appendix.³ When the cyst ruptures its viscid contents escape into the peritoneal cavity and are widely diffused. The peritoneum loses its gloss, becomes thickened and opaque, and where it is in contact with the gelatinous material is covered with shaggy adhesions; in some places small nodules like miliary tubercles are seen in its substance. It is a disputed point as to whether the mucinous material is elaborated by the peritoneum as the result either of a chronic inflammation or of a myxomatous degeneration, or whether the changes in the peritoneum result from attempts on the part of that membrane to absorb and remove the foreign material. The latter view is probably correct: the microscopic appearances suggest that the endothelial cells of the peritoneum exert a solvent action upon the mucinous masses

¹ *Trans. Obstet. Soc. of London*, 1905, p. 411.

² *Amer. Journ. of Obstet.*, March 1906, p. 345.

³ Thomas Wilson, *Proceedings of the Royal Society of Medicine*, 1913, vol. vi., *Obstet. and Gyn. Sect.*, p. 15.

which are then absorbed into the lymphatics and connective-tissue spaces. In many places the endothelial covering is lost and strands of the sub-endothelial connective-tissue carrying blood-vessels penetrate into the gelatinous masses; in the neighbourhood of the vessels round-celled infiltration and collections of plasma-cells are seen, suggesting an attempt to encapsule and isolate the mass. Such encapsuled masses may persist indefinitely, or may be slowly absorbed, leaving firm adhesions or great thickening of the peritoneum.

Implantation metastases from the original cyst may be found in any part of the abdominal cavity, and the epithelial cells of such metastases may continue to

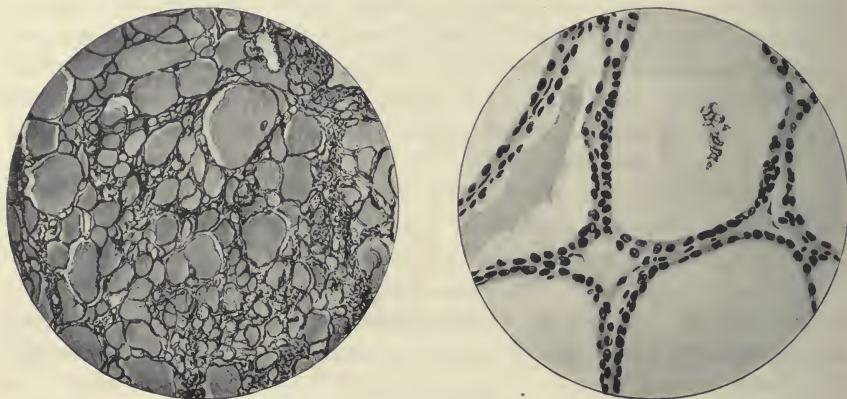


FIG. 401.—Thyroid-like tissue from an ovarian cyst. (Bell.)

form new mucinous masses necessitating repeated operations for their removal. In rare instances embolic metastases have been found in the lungs.

The Presence of Thyroid-like Tissue in Ovarian Cysts.—In certain ovarian cysts tissue indistinguishable from that of the thyroid gland has been found; in some instances the whole tumour is composed of such tissue, in others small areas only are found in a cystic teratoma or a pseudo-mucinous cyst (Fig. 401). The nature and origin of this tissue has given rise to much discussion; the first recorded case was described by Gottschalk under the name of '*folliculoma malignum ovarii*,' and somewhat later Kretschmar described a similar tumour as an endo-thelioma. The presence of iodine in the colloid material of the acini, and the fact that the tissues exhibit bio-chemical reactions to Mallory's stain identical with those of the thyroid gland, render it probable that the histological appearances are not due merely to a colloidal degeneration of a cyst-adenoma as suggested by

Bell, but that the tumour is composed of true thyroid tissue. It has been suggested that the tumours represent metastases of the thyroid gland, and in five cases they were found in association with goitre; it is, however, more probable that the explanation offered by Pick is the correct one. According to Pick all such tumours are teratomata: this view may be accepted unhesitatingly when heterogeneous tissues, such as bone, cartilage, and nerve-cells, are also found, whether the thyroid tissue be present in small quantity only or form the greater part of the tumour. Pick regards the tumours composed solely of thyroid tissue as teratomata in which, during the course of development, all tissues derived from two of the germinal layers have been suppressed and one type of tissue alone has survived. Some support is afforded to this view by the fact that an isolated tooth with no traces of other embryonal structures has been found in an ovary by Sanger; in this case it seems probable that the tooth originated in an embryoma, the other portions of which had atrophied and disappeared. Walthard cut in serial section three tumours composed apparently solely of thyroid tissue; in two of them he found minute areas of cartilage and of squamous epithelium which would certainly not have been detected by the ordinary methods of examination, in the third tumour he found nothing but thyroid tissue and ovarian stroma. The tumours are usually unilateral; only one instance of a bilateral growth has been recorded. Although usually innocent there is no doubt that thyroid ovarian tumours are occasionally malignant; invasion of surrounding structures, local recurrence after removal, and visceral metastases have all been found at autopsy.

Papillomatous Tumours of the Ovary

Papillomatous growths of the ovary occur in two forms: (1) as excrescences springing from the wall of a cyst and projecting into its cavity, (2) as sessile or pedunculated growths on the surface of the gland. A sharp line of division cannot be drawn between the two; a tumour composed mainly of surface-papillomata may contain cystic cavities into which papillary processes project, and a papillary cystoma may exhibit surface-growths. For purposes of description, however, it will be convenient to observe the distinction and to study first papillomatous cysts, and secondly surface-papillomata.

Papillomatous Cysts.—These tumours differ in many important respects from the cyst-adenomata just described. The main points of difference may be summarized as follows:

- (1) They are usually bilateral.
- (2) They contain papillomatous masses which, if the cyst-wall ruptures, become distributed over the peritoneum and give rise to implantation metastases.

(3) They exhibit a marked tendency to burrow between the two layers of the broad ligament.

(4) They are unilocular, or consist of only a small number of loculi.

(5) They seldom attain a size larger than a man's head.

(6) Their contents consist of clear serous fluid.

(7) The epithelium lining them is often polymorphous.

(8) Psammoma-bodies are common in both the epithelial and connective-tissue cells.

Papillomatous cysts are usually smooth, rounded tumours; the external surface of the wall is dead white or glistening, whilst here and there upon the surface are small irregularities corresponding to masses of papillomatous growth within the cyst. Some of the tumours possess a well-marked pedicle but many are sessile, growing between the two layers of the broad ligament. They may strip the peritoneum from the pelvic walls and spread outwards into the iliac fossa or backwards towards the rectum. They often displace the uterus, pushing it to one side or dragging it up in the abdomen so that the fundus lies at the level of the umbilicus and the supravaginal portion of the cervix is elongated. The cysts are either unilocular or composed of a few loculi only, and projecting from the inner wall are masses of papillomatous growths. Unfortunately cysts exhibiting small warty projections of the connective tissue covered by a single layer of epithelium are often described as papillomatous cysts: such a nomenclature is misleading; these areas of localized hypertrophy of the connective tissue have nothing in common with the papillomata we are describing. True papillomata occur as villous arborescent processes, some no larger than a pin's head, others forming considerable masses (Fig. 402); their surface is warty and irregular, their colour pink or white, and their consistence soft and friable. They are attached to the cyst-wall by pedicles, some thin and thread-like, others broad and short.

The cyst is filled with clear watery fluid of specific gravity from 1005 to 1040. It contains albumen and, very rarely, mucinous material. Epithelial cells, cholesterin, and haematoidin crystals are occasionally found on microscopical examination. The fluid is furnished mainly by transudation from the vessels of the papillary growths; sometimes it is stained by blood-pigments.

Microscopical Structure.—In the cyst-wall three layers may be distinguished: (1) an outer layer of laminated connective tissue often containing unstriped muscle-fibres; (2) a middle layer, looser, more cellular, and vascular; (3) an inner layer of epithelium resting upon a basement membrane (Fig. 403). Traces of ovarian tissue may be found in the walls of the smaller tumours, but can seldom be dis-

covered in those of large size. The epithelial cells exhibit great diversity in size and shape; they are usually cubical or columnar, occasionally ciliated. All three varieties may be found in the same tumour. Polymorphism of epithelium and the presence of ciliated cells have been regarded as pathognomonic of the papillary cystomata; this view is, however, incorrect. Another striking feature of the walls of these cysts is the presence of psammoma-bodies in both epithelial and connective-tissue cells. They consist of particles of calcareous matter (carbonate and phosphate of calcium) arranged concentrically, and vary in size from microscopic objects to masses visible to the naked eye and easily appreciable to the touch. Their development has been studied by Whitridge Williams. The affected cell swells up, its

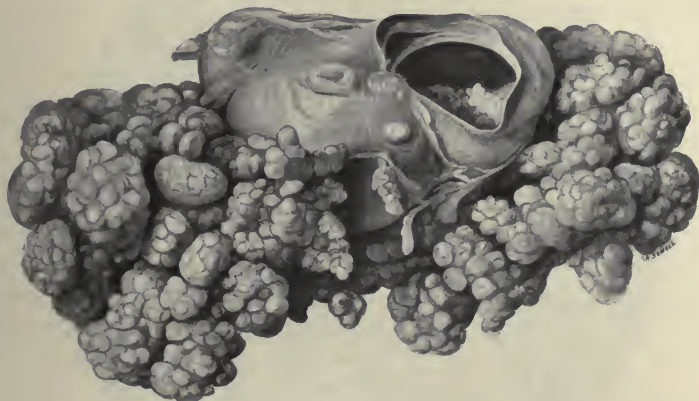


FIG. 402.—Papillomatous ovarian cyst.
(St. Bartholomew's Hospital Museum, No. 2913 C.)

contents undergo fluid degeneration, the nucleus is pushed to one side and finally disappears. Several adjacent cells undergo the change simultaneously and fuse together; in the mass so formed small calcareous grains are deposited in a concentric manner.

The papillary growths consist of a connective-tissue stroma and an epithelial investment. The stroma sometimes resembles more or less closely the connective tissue of the ovary, and consists of short wavy fibres with numerous spindle-cells; more often we find a loose-meshed myxomatous stroma composed of star-shaped connective-tissue cells and capillary loops of vessels. This type of tissue represents a stage in development rather than in degeneration, for many fibroblasts are present. The epithelium is usually cylindrical and sometimes ciliated.

Mode of Formation of the Papillary Processes.—The epithelium at one spot

proliferates and gives rise to several layers forming a small bud which projects from the surface; later, connective-tissue spindle cells and capillary loops from the stroma grow into the bud.

Surface-Papillomata.—Papillomatous growths may be present on the surface of the ovary in the form of a single outgrowth or of a cauliflower-like mass. They may be sessile or pedunculated. The interior of the ovary may show little change, or cysts containing papillomata may be found. The stroma is cellular and rich in

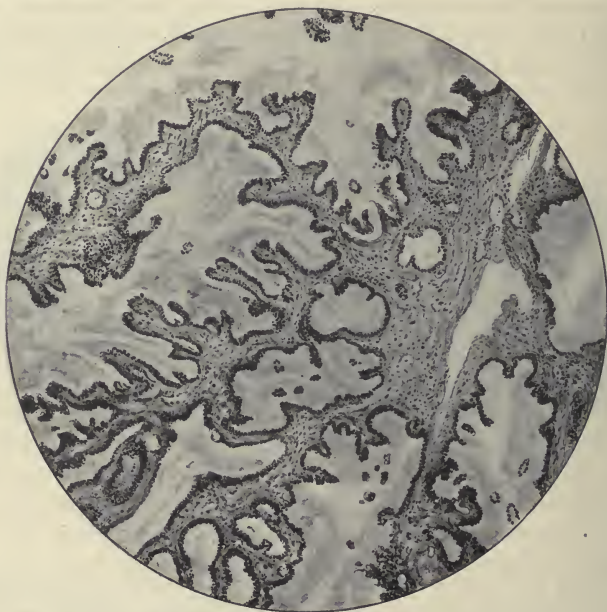


FIG. 403.—Microscopic section of papillomatous ovarian cyst.

blood-vessels, the epithelium may be cubical, columnar, or ciliated; and psammomata are often present in both stroma and epithelium. Processes from the surface-epithelium extend into the ovarian stroma and appear in section as duct-like canals lined by ciliated epithelium.

Frequency of Ovarian Papillomata.—Whitridge Williams¹ found 100 instances of papillary tumours in a series of 1058 consecutive ovariectomies. The proportion to the cyst-adenomata was as 1 to 10.

¹ *Johns Hopkins Hospital Reports*, vol. iii.

Clinical Features.—These tumours stand on the border line between innocence and malignancy. So long as the papillary growths are confined within the cyst they behave like benign tumours; but should rupture of the cyst occur, from violence, from degeneration of the wall, or from pressure of the papillary masses, the growths become implanted upon the peritoneum in all parts of the abdominal cavity. Even after this event if the cyst be completely removed the implantation growths will in course of time shrivel and disappear. An explanation of the phenomenon has been suggested by Bland-Sutton: "The life of multiple warts is often very transient and this is probably the case with peritoneal papillomata; but so long as the seed-supply continues new warts spring up and die, to be succeeded in their turn by a new crop. When the source of epithelium is removed by operation the warts then existing die and the crop is not renewed."

When the papillomata becomes disseminated ascites and, more rarely, hydrothorax develop. True metastases, as distinguished from implantation growths, have on several occasions been found in the lungs, the pleura, and other viscera. In these cases emboli of epithelial cells are carried by the lymphatics or bloodstream.

We have already spoken of the difficulty sometimes found in distinguishing between papillomatous and carcinomatous ovarian cysts. It is often said that papillomatous tumours tend to become malignant; it may be that tumours originally innocent sometimes develop malignant characters, but it is more probable that the majority of such tumours are malignant from the first.

TERATOMATA

The terms 'teratoma' and 'embryoma' are applied to a group of neoplasms built up of heterogeneous tissue elements. The tissues are often well differentiated and so grouped together as to form structures resembling the mature organs of the body. They arise most commonly in the sex-glands, and are more frequent in the ovary than in the testicle.

In the ovary two groups of teratomata are to be distinguished:

1. Teratomatous cysts.
2. Solid teratoma.

Teratomatous Ovarian Cysts

These tumours are often termed 'dermoids' but this name is misleading. A dermoid is an inclusion cyst whose walls contain structures derived from the

ectoderm only; the cavity is lined throughout with skin and its appendages and never contains hypoblastic structures like intestinal or respiratory mucous membrane, nor mesoblastic structures like unstriated muscle, bone, or cartilage. In ovarian 'dermoids' such structures can be demonstrated, and these tumours should therefore be called teratomata. The existence of simple ectodermal inclusion cysts of the ovary has yet to be proved.

A teratomatous ovarian cyst is composed of two parts:

(i.) An embryonal rudiment in which we can usually demonstrate tissues derived from all three layers of the blastoderm.

(ii.) A cyst in which this rudiment is growing.

The tumours are usually unilateral but occasionally bilateral; they have been found in the single ovary associated with a unicornuate uterus, and also in an accessory ovary; their growth is commonly extra-ligamentary, very rarely they lie partially or completely between the two layers of the broad ligament. In shape they are usually spherical; the surface is smooth, glistening, and often of a yellow colour. The relation between the ovary and the tumour varies; most often the ovary is flattened and incorporated with the cyst-wall to such an extent that it can be discovered only by microscopical examination; sometimes it forms a projection on the wall of the cyst. Very rarely the tumour is attached to the ovary by a definite pedicle; the tumour may lose its connection with the broad ligament from torsion and atrophy of the pedicle, and may become secondarily attached to the omentum or other abdominal viscera. The cyst-cavity is occupied by thick sebaceous material and hair. The sebaceous matter contains cell-remains, granular detritus, fat-globules, and cholesterin-plates. Occasionally we find small rounded bodies consisting of a nucleus of hair to which masses of epithelium are adherent; hundreds of these balls may be found in one tumour. Cystic teratomata are usually unilocular but some are composed of two or three loculi. It is not uncommon to find a teratoma and a multilocular cyst-adenoma or papilloma developing in the same ovary. In these cases the rapidly-growing cyst-adenoma may completely envelop the teratoma which is found embedded in its substance. Ovarian tissue can usually be found in the wall of the cyst; it may be normal in appearance but often contains degenerate or cystic follicles. Corpora lutea are often seen, and their presence proves that in spite of the teratoma the ovary is still functional, a fact which must make us hesitate before removing bilateral teratomata in young women (Figs. 404 and 405). The cyst-wall is lined by skin in the immediate neighbourhood of the embryoma, and in this portion of the wall only hair-follicles are found. Throughout the rest of its extent the lining wall is smooth or covered by a dense granulation tissue in

which hairs and cholesterin-plates are embedded. In this granulation tissue we find large multi-nucleated cells resembling the giant-cells seen around foreign bodies which have been embedded for a considerable time in living tissue; they are grouped round the hairs which traverse, but never arise from, the granulation tissue; the granulation layer is formed in response to the irritation caused by the hairs.

From one part of the wall a rounded mass projects into the cavity. This is the embryoma (Figs. 405 and 406). The skin which covers the protuberance extends for a short distance around its base on to the wall of the cyst; the hairs which spring from it are of one colour only. The embryoma does not always form a distinct eminence, it

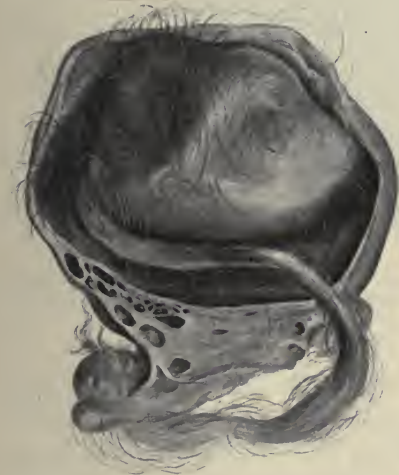


FIG. 405.—Teratomatous ovarian cyst containing a well-marked embryoma.
(St. Bartholomew's Hospital Museum, No. 2917 F.)

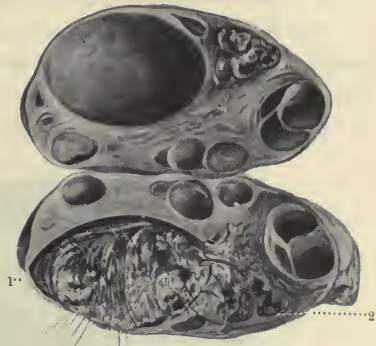


FIG. 404.—An ovary containing a small teratoma.
1, Embryoma; 2, corpus luteum.
(St. Bartholomew's Hospital Museum, No. 2917.)

is sometimes flattened, compressed and incorporated with the cyst-wall, but in these cases microscopical examination will usually disclose the presence of tissues derived from all three germinal layers. The embryoma consists sometimes mainly of skin and its appendages, sometimes of mucous membrane traversed by epithelium-lined canals and sometimes of tissues—epiblastic, mesoblastic, and hypoblastic—which bear a close resemblance to those of the cephalic extremity of the embryo. Under the skin small flat plates of bone are often found, and beneath them is commonly a stratum of brain-tissue. Through mechanical pressure within the cyst, the growth of the embryonal formation is hindered, and those tissues which develop earliest in the embryo alone survive,

hence ectodermal and cephalic structures are present in greater abundance than

those derived from the entoderm. Occasionally well-formed foetal limbs or portions of the trunk are found in the cyst (Figs. 407 and 408).

The relation of the embryoma to the cyst in which it is found is not definitely known. Pfannenstiel attributes the development of the embryonal rudiment to cyst-formation; Wilms believes the embryoma is the cause of the cyst.

Structures found in Teratomatous Cysts.—(i.) *Epiblastic Structures.*—The skin



FIG. 406.—A teratomatous ovarian cyst showing: 1, nipple-shaped projection (embryoma); 2, arc of skin; 3, cyst-wall lined by granulation tissue; 4, mass of hair occupying cyst-cavity; 5, Fallopian tube.

(St. Bartholomew's Hospital Museum.)

resembles that covering the surface of the body, but the papillae are usually small and touch-corpuscles are absent; pigment-granules are often present in the deeper cells of the epidermis. The *cutis vera* rests upon a connective-tissue layer containing fat and not uncommonly unstriped muscle-fibres also. The hairs are usually of one colour and have been found to measure as much as fifty inches in length (Fig. 406).

Sebaceous glands are present in large quantities, sweat-glands are few and ill-developed; their ducts are straight and not of the spiral form seen in normal skin.

Teeth are present in about 50 per cent of the tumours; as many as 300 have

been found in a single specimen. They possess enamel, dentine, and a pulp containing nerve-fibrils. They usually resemble canines or incisors and possess only one root. They are sometimes embedded in flat plates of bone, formed like the dental processes of the jaws, and surrounded at their bases by a structure resembling the mucous membrane of the gums.



FIG. 407.—Embryoma containing rudimentary trunk and lower limbs of a foetus.
(St. Bartholomew's Hospital Museum, No. 2917 H.)

Nails are occasionally present attached to the extremities of phalanx-like portions of bone.

Mammary structures, with nipple-like projections of the skin, have been described by Bland-Sutton, Velits, and others.

Nervous Structures.—Brain-like tissues are found most often in the form of a reticulated neuroglia in which nerve-fibres and nerve-cells are sparsely scattered. A central canal with dilatations lined by ciliated epithelium representing the ventricles of the brain is not rare; choroidal and retinal structures have also been

repeatedly described. It is worthy of note that, whilst the central nervous system is frequently represented, peripheral structures are seldom found.

(ii.) *Mesoblastic Structures*.—Fibrous and fatty tissues, unstriped muscle, and islands of hyaline cartilage are common. Bone is present in the majority of cysts, usually in the form of flat plates but occasionally long bones, phalanges, and ribs

are seen. Wilms gives an illustration of a temporal bone with external auditory meatus and styloid process, and remarks that well-developed bones usually belong to the cephalic region.

The circulatory system of the embryoma communicates with that of the host, but the vessels of the cyst are formed from the tumour-mesoderm; in one case Wilms found an external and internal carotid artery.

(iii.) *Hypoblastic Structures* are but little represented. In our own specimens we have found thyroid gland, intestine, stomach, and trachea.

Clinical Features.—*Age of Occurrence*.—Teratomatous cysts have been found at all periods of life—in an eight-months foetus



FIG. 408.—An embryoma or parasite projecting into its containing cyst, showing ill-developed lower limbs and a vulva. Above the vulva is a well-marked tuft of pubic hair. Above the skin-covered portion of the parasite is a coelomic cavity containing a blind coil of intestine. (Shattock.)

(Museum of Royal College of Surgeons, No. 4526 C.)

and in a woman of eighty-three. They are most common during the years of child-bearing life.

The Rate of Growth.—Generally speaking, cystic teratomata are slowly-growing tumours. Sanger has removed one known to have existed for twenty years. We have removed one from a woman of sixty-three and found the cyst wall extensively infiltrated with calcareous salts and the tissues of the embryoma sclerosed. The cysts seldom attain a large size; it is rare to find them larger than a foetal head, but there is a specimen in the museum of St. Bartholomew's Hospital as large as a football. As already stated, a teratomatous cyst may become fused with, or develop within a cyst-adenoma; in this case the whole tumour may attain an enormous size.

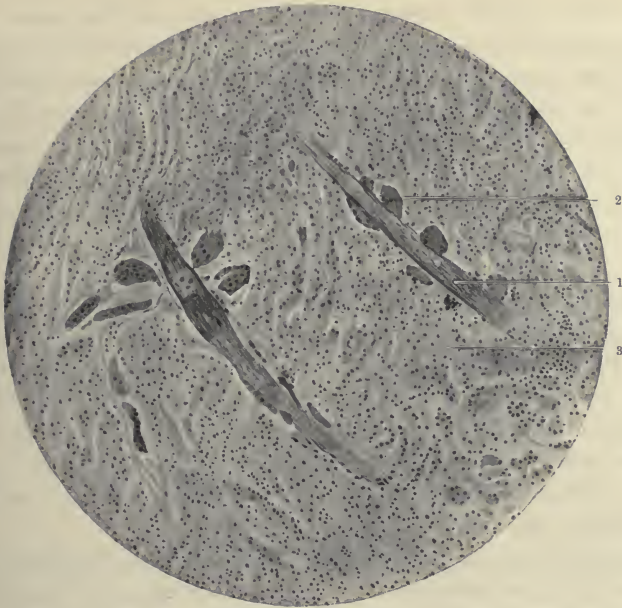


FIG. 409.—Section taken from cyst-wall at spot marked (3) in Fig. 406.

The wall here contains no embryonal structures, but consists of granulation tissue in which are embedded hairs; around the hairs are grouped giant-cells. 1, Hair; 2, giant-cells; 3, granulation tissue.

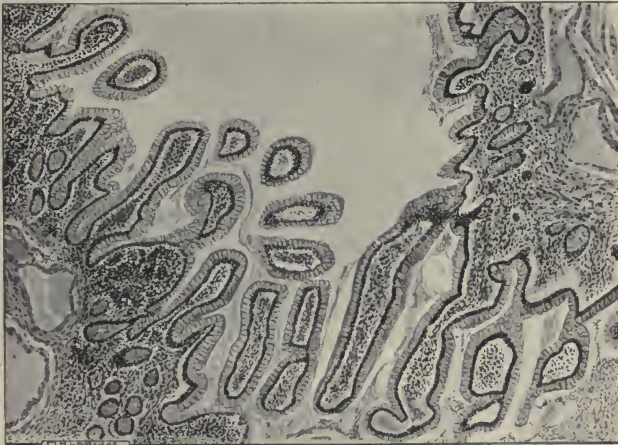


FIG. 410.—Section through the projection marked (1) in Fig. 406.

The tissues bear a close resemblance to those of the small intestine.

Implantation Growths.—Occasionally from violence or from some other cause the cyst ruptures and its contents become scattered over the peritoneal cavity. Under these circumstances numerous small tumours may be found attached to the peritoneum ; in some cases the secondary growths reproduce the complex structures of the embryoma, in others they consist merely of skin containing sebaceous glands and tufts of hair. They are found as the result of implantation of disseminated portions of the original tumour upon a peritoneal surface, and exhibit no tendency to invade or destroy the tissues upon which they have become implanted.

Occasional Malignant Characters of the Cystic Teratomata.—It is a matter of common knowledge that the majority of cystic ovarian teratomata are innocent tumours. They grow slowly, they are enclosed in a definite capsule, they neither invade the tissues of adjacent organs nor infect lymphatic glands. The majority of solid ovarian teratomata are, on the contrary, tumours of intense malignancy, invading surrounding structures and giving rise to metastatic deposits. It becomes, therefore, a matter of importance to ascertain whether the cystic teratomata ever exhibit malignant characters.

Implantation growths, the result of epithelial infection following the rupture of a dermoid cyst, have sometimes been mistaken for malignant deposits, and from the presence of these secondary growths it has been deduced that the primary growth must be of a malignant nature. Other writers have fallen into error in the opposite direction, and recognizing the occurrence of epithelial infection have asserted that ovarian 'dermoids' are invariably innocent tumours. This, however, is not the case ; it is now clearly established that the embryoma contained within the cyst may be the site of either a sarcomatous or a carcinomatous growth.

It is necessary to remember that a teratoma may be invaded from without by a malignant growth ; we have recorded an instance of such invasion by a columnar-celled carcinoma of the sigmoid : or again (as in a case recorded by Lindsay Peters) two tumours may co-exist in the same ovary, the one a teratoma, the other a carcinoma. Further, a recent case of Hellier and Stewart suggests that a carcinoma arising in some other part of the body may give rise to secondary metastatic growths in a teratoma. When all cases of this nature have been excluded there remains a group in which the growth undoubtedly originated in the tissues of the teratoma itself. The commonest type of growth is squamous-celled carcinoma (Fig. 411). In 1911¹ we collected 16 such cases and recorded 4 new ones. The malignant cells invade and destroy the tissues of the host as well as those of the teratoma.

¹ *Journal of Obstet. and Gyn. of Brit. Empire*, vol. xx. p. 211.



FIG. 411.—Section through the wall of a teratomatous ovarian cyst, showing invasion of the wall by a squamous-celled carcinoma. (Low power.)

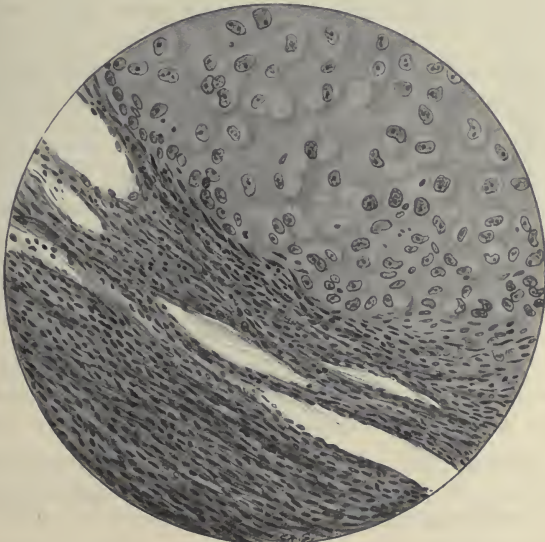


FIG. 412.—Section through the wall of a teratomatous ovarian cyst, showing invasion of the wall by a squamous-celled carcinoma. (High power.)

The occasional malignant character of the ovarian thyroid tumours has already been mentioned.

Solid Teratomata

Solid teratomata are rare. They differ from the cystic variety in that they are usually intensely malignant tumours. They are capable of reaching enormous dimensions and in some instances grow with great rapidity, attaining a large size within a few weeks. They are usually pedunculated, globular in shape, with a surface which is smooth or bossed; they possess a capsule composed of fibrous tissue and altered ovarian stroma. On section they are never completely solid but contain numerous cystic spaces of varying size lined by epithelium.

On microscopical examination the tumour is found to be a heterogeneous collection of tissue-elements sometimes so grouped together as to resemble the organs of the foetus; thus in the specimens we have investigated we have found liver, trachea, retina, bone, cartilage, neuroglia, nerve-cells, and intestine. The walls of the cysts are usually lined by epithelium—sometimes columnar, sometimes cubical, and sometimes ciliated. The various structures are bound together by a stroma composed partly of fibrous tissue and partly of cells of an embryonic character; in one of our specimens there were present also masses and columns of epithelial cells exhibiting the atypical forms and irregular growth which we associate with carcinoma.

We have collected 14 cases from the literature and have reported 2 which came under our own observation.¹ From a study of these 16 cases we draw the following conclusions:

1. *Age*.—The youngest patient was four years of age, the oldest thirty. Twelve out of the sixteen patients were between the ages of thirteen and twenty-three.

2. *The Innocent or Malignant Nature of the Growths*.—Of the sixteen patients, twelve died within a year of the onset of symptoms and only two were known to be alive two years after operation. In the majority of the cases recurrence and dissemination took place with great rapidity.

3. *The Secondary Growths*.—In most cases these were confined to the peritoneum and retroperitoneal lymphatic glands, but in several visceral metastases were present in the liver, the lungs, and the brain. The peritoneal growths were usually very superficial, in some instances forming pedunculated masses projecting into the abdominal cavity, in others spreading widely over the surface of the peritoneum but not deeply infiltrating the subjacent tissues.

¹ *St. Bartholomew's Hospital Reports*, vol. xlii.

4. *The Histological Characters of the Secondary Growths.*—We may recognize two distinct classes : (a) in which the complicated structures of the primary growth

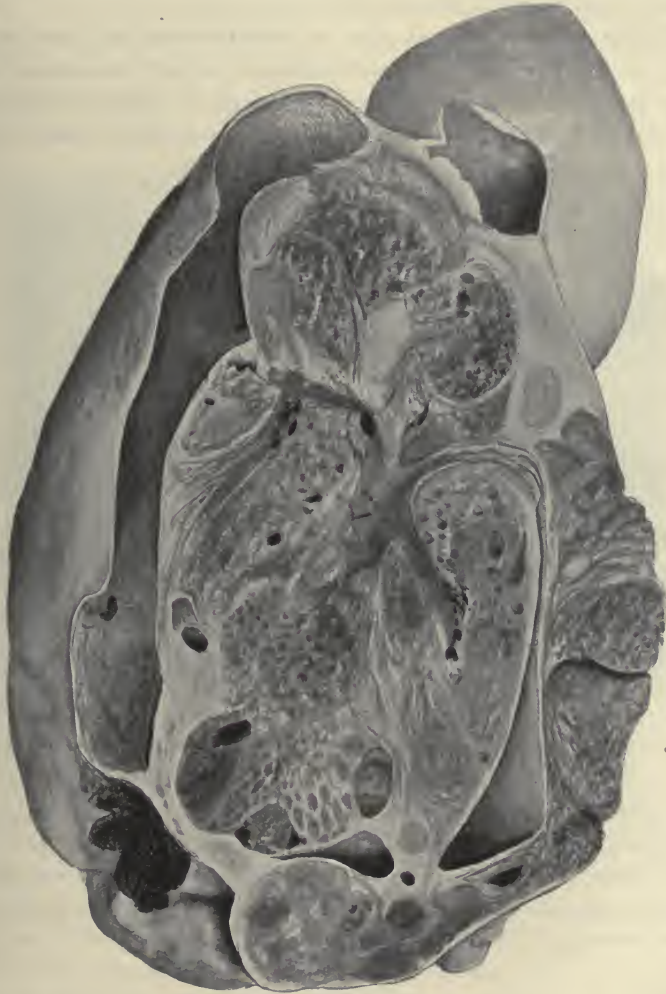


FIG. 413.—Solid teratoma of the ovary removed by operation from a girl sixteen years of age. Within three months of operation masses of recurrent growth could be felt in various parts of the abdominal cavity. (From a specimen in St. Bartholomew's Hospital Museum.)

are reproduced ; (b) in which the secondary growths are of the characters of sarcomata

or carcinomata. The existence of the first group convinces us that many solid teratomata of the ovary are malignant tumours *per se*, and not merely in virtue of sarcomatous or carcinomatous tissues which they contain.

5. *The Clinical Manifestations.*—The clinical histories of the cases present no distinctive features; in most instances the symptom which first attracted attention was a painless enlargement of the abdomen. As the tumour increased in size pressure symptoms manifested themselves, dyspnoea on exertion, oedema of the legs,

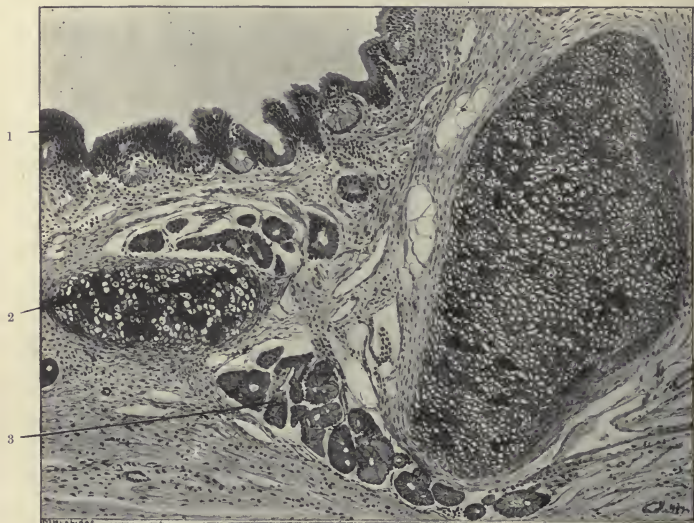


FIG. 414.—A section from part of the tumour shown in Fig. 413.

Cartilage, unstriated muscle, mucous glands, and a mucous membrane resembling that of the small intestine are seen. 1, Intestinal mucosa; 2, cartilage; 3, mucous glands.

and digestive disturbances. Ascites was noticed in several of the cases in comparatively early stages of the disease and before peritoneal metastases had developed. Pain was usually present but was not always an early symptom; menstruation was unaffected in the majority of the cases. Wasting and cachexia were noted only in the last stages.

Genesis of Ovarian Teratomata

The origin of these tumours is still a matter of speculation. In the Middle Ages they were believed to result from impregnation by the devil, but Astruc or Krüger

long ago remarked that devil-pregnancy occurred only to those young women and widows "*quae rationes et castitatis prae se ferunt speciem.*"

The theory of epiblastic sequestration, although it furnishes an adequate explanation of the presence of dermoid cysts in various parts of the body, cannot be applied to ovarian teratomata, for they contain mesoblastic and hypoblastic structures in addition to those derived from the epiblast. The same objection is fatal to the view, once widely held, that 'ovarian dermoids' are derived from the Wolffian body; it is inconceivable that Wolffian remains in the ovary can give rise to these complicated tumours. The theory that teratomata result from impregnation of mature ova before they have left the Gräafian follicles can be dismissed in very few words: they occur in virgins, in young children, and have been found in the unborn foetus. We know that the ovum may be fertilized whilst still within the follicle, but the result is an ovarian gestation not a teratoma.

In 1815 Meckel suggested the possibility of the inclusion of one fertilized ovum within another, the included ovum failing to develop upon normal lines. Such a phenomenon undoubtedly occurs, but in other parts of the body is excessively rare. Ovarian teratomata, on the contrary, are very common tumours, and it is difficult to understand why impaction should take place so commonly in the ovary and so rarely elsewhere. Another difficulty in accepting this theory is found in the occasional presence of multiple teratomata in the same ovary. One specimen exists in which five separate embryomata are seen, and such a phenomenon cannot be explained by a theory of included foetuses. The colour of the hair found in the tumours often differs markedly from that of the patient; this fact suggests that the piliferous area of the embryoma is not of the same histogenic origin as the piliferous areas of the patient, and further that the embryoma and the patient are not to be regarded as homologous twins.

Shattock¹ suggests that an embryoma may result from the fertilization of one of the primordial ova in the ovary of the developing embryo, so that the embryo gives rise to a second imperfect individual whose origin is not synchronous with but of later date than itself (epiembryogenesis).

He points out that at the time of impregnation the ovum is sometimes penetrated by more than one spermatozoon and that the primordial ova are formed at a very early stage of the development of the embryo: "It becomes thus conceivable that surplus spermatozoa may remain about the segmenting mass or morula, may become engaged between its component cells and in this way be actually ready in the blastoderm to fertilize the primordial ova, which are developed soon after its

¹ *Trans. Path. Soc. London*, vol. lviii.

lamination and the cleavage of the mesoblast which results in the formation of the body cavity." This theory is free from many of the objections raised to the older views but at present is devoid of scientific proof.

The theory of the origin of teratomata from 'cell-rests' is an interesting and suggestive one. Bonnet has shown experimentally that by shaking an ovum a blastomere may be displaced and develop into a second individual; he suggests that during an early stage of development of the foetus a 'toti-potent' cell may become dislocated and eventually implanted in the stroma of the ovary. After a longer or shorter quiescent period it may actively divide and give rise to a tumour containing derivatives of all three layers of the blastoderm.

Finally it is necessary to refer to the theories of parthenogenesis and sporogeny. In parthenogenesis maturation of the ovum takes place, and the process of embryogenesis is initiated by the fusion of the germinal vesicle with the second polar body. In sporogeny the embryo develops from the ovum independently of maturation or fertilization; both these phenomena have been observed in certain insects and in the jelly-fish, but whether they ever occur in the human ovum is a question for grave doubt. We can draw no conclusion more definite than that drawn by Wilms: "The origin must always be in a sex-cell; this is the only possible explanation of the existence of the three-layered germinal rudiment . . . as to the cause of the proliferation we are as yet entirely in the dark."

Tubo-Ovarian Cysts

When, as sometimes happens, a hydrosalpinx and an ovarian cyst exist coincidentally, inflammatory adhesions may form between the two, and later, by absorption of the septum, one single cyst-cavity result (Fig. 415). This is without doubt the commonest mode of formation of tubo-ovarian cysts. In the museum of St. Bartholomew's Hospital there is a very complete series of specimens illustrating the different stages in the process of fusion; these specimens have been described by Griffith in vol. xxix. of the Obstetrical Society's *Transactions*. It must be remembered that many tumours which at first glance appear to be tubo-ovarian cysts prove on more careful examination to be specimens of hydrosalpinx in which the distal portion of the tube, greatly distended, conceals the flattened ovary.

A special variety has been described under the name of 'ovarian hydrocele.' The ovarian sac constantly present in some animals is occasionally found in human beings. In such cases the ovary is completely invested by a sac of peritoneum constituting a *tunica vaginalis* into which the ostium of the tube opens. In animals hydrocele of the *tunica vaginalis* of the ovary is a well-known condition, and accord-

ing to Bland-Sutton is also occasionally found in the human subject. He describes its distinctive characters as follows: "The Fallopian tube, elongated and tortuous, opens by its ostium into a sac on the posterior aspect of the broad ligament; there is usually no evidence of inflammation, but the cyst may suppurate should the tube become infected; in small specimens the ovary projects on the floor of the sac, in



FIG. 415.—Specimen illustrating mode of origin of tubo-ovarian cysts.
(St. Bartholomew's Hospital Museum, No. 2936 A.)

larger specimens it is incorporated with the wall, and in very large tumours is unrecognizable."

Broad-Ligament Cysts

Under this term we include a number of cystic formations found between the two layers of the broad ligament and developed in connection with (i.) the *fimbria ovarica* of the tube, (ii.) the parovarium or organ of Rosenmüller, (iii.) accessory Fallopian tubes or ostia, and (iv.) the hydatid of Morgagni (Fig. 416).

Recent work by Keith¹ has shed a new light upon the origin of many broad-ligament cysts. It has long been commonly accepted that the so-called 'parovarian' cysts arose from the organ of Rosenmüller. Keith has demonstrated that many broad-ligament cysts arise from developmental remains in the *fimbria ovarica* of the Fallopian tube. In this situation tubules are found corresponding to, and probably homologous with, the rete testis of the male. It is probable that most broad-ligament cysts which attain a large size and assume clinical importance arise from these structures and are therefore pronephric, not mesonephric, in origin. The

¹ *Journal of Obstet. and Gyn. of British Empire*, October 1910.

term 'parovarian' is incorrect when applied to such cysts, and it is proposed to substitute the term 'fimbrial.'

Fimbrial Cysts.—These develop in the mesosalpinx and as they grow separate

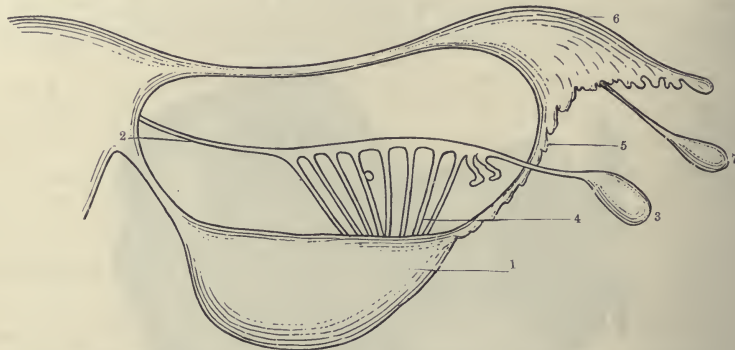


FIG. 416.—Diagram of the structures in, and adjacent to, the broad ligament. (Doran.)
1, Hilum of ovary; 2, Gartner's duct; 3, pronephric cyst; 4, vertical tubules of parovarium;
5, fimbria ovarica of Fallopian tube; 6, Fallopian tube; 7, Hydatid of Morgagni.

the two peritoneal layers of which it is composed. They may measure only a few millimetres in diameter or may form enormous tumours occupying the greater part of the abdominal cavity. They are smooth, translucent, thin-walled, and only loosely united to the enveloping peritoneum (Fig. 417); their pedicle is broader



FIG. 417.—Fimbrial cyst.
Probably developed from vestigial remains, the homologues of the rete testes. (Doran.)

and less distinct than that of an ovarian tumour, and not infrequently they burrow deeply into the tissues of the pelvic floor, sometimes displacing the uterus, or stripping up the peritoneum from the abdominal walls.

The relations of the tube and ovary are characteristic: the tube is arched over the upper surface of the tumour and is elongated; in one specimen in St. Bartholomew's Hospital Museum it measures 17 inches in length; the tubal ostium opens on the surface and the ovarian fimbria remains attached to the cyst but is flattened and spread out (Fig. 418). The ovary is usually separate and distinct but is sometimes fused with, and projects from, the cyst wall.

The lining wall is smooth but it is common to find small warty protuberances scattered over it (papillary fibromata) and occasionally these attain considerable dimensions; more rarely we find slender branching processes or cauliflower-like masses (papillary adenomata). The cyst is usually unilocular and its contents consist of pale limpid fluid of specific gravity 1.004 to 1.006, alkaline in reaction, poor in albumen, and occasionally containing pseudo-mucin. Microscopically, the cyst-wall is composed of a loose-meshed connective tissue containing unstriated muscle-fibres and lined by a single layer of columnar ciliated epithelium resting upon

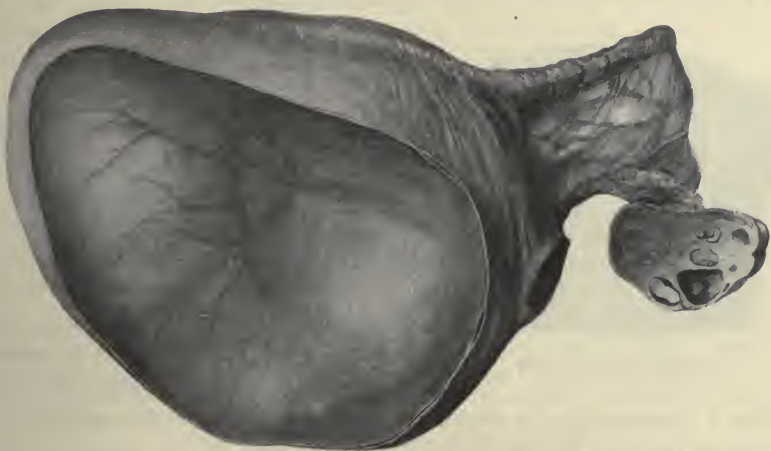


FIG. 418.—Fimbrial cyst.
(St. Bartholomew's Hospital Museum, No. 2923.)

a basement membrane. No matter how large the cyst, columnar ciliated epithelium can be demonstrated in some part of its wall. These cysts resemble in many of their characters papillary cysts arising in the hilum of the ovary, and it is possible that both groups of tumours have a common origin. Fimbrial cysts often grow slowly and may exist for as long as ten years before serious pressure symptoms are caused. It is doubtful if they ever develop before puberty.

Origin of Fimbrial Cysts.—Keith has shown that the *fimbria ovarica* is formed in part from the genital ridge, and that in the new-born child ovarian (hilum) tissue can be traced for some distance in the fimbria. In 20 per cent of all subjects a minute cyst is found connected with the ovarian fimbria and by comparing the male and female gland Keith reached the conclusion that the fimbrial cyst is developed from homologues of the rete testis. “In the male the tubuli seminiferi are continued

as the rete testis in the border of the genital gland and pass on through the mesonephros or vasa efferentia to the vas deferens. In the female, tubules which tend to become cystic are found in the neighbourhood of the ovarian fimbria and correspond in position to the rete testis. As in the male, these tubules are quite distinct from the mesonephros, that is from the vertical tubes of the parovarium. Thus the parovarium or Wolffian body is not the parent of these cysts." In the College of Surgeons' Museum is a series of specimens showing all stages of the development of a minute fimbrial cyst into a large tumour, whilst intermediate stages between the small parovarian cysts, to be described presently, and large tumours have never

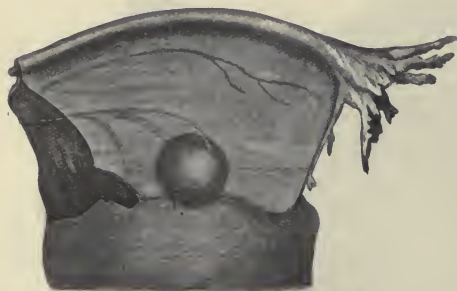


FIG. 419.—Parovarian cyst. (Doran.)

been seen. It is probable therefore that the large broad-ligament cysts are developed from relics of the pronephros and are not parovarian in origin.

Parovarian Cysts.—The parovarium or organ of Rosenmüller represents the remains of the mesonephros. It consists of a duct, the duct of Gartner, and a number of vertical tubules which pass towards the hilum of the ovary; it reaches its

highest development late in sexual life, commonly about the thirty-fifth year. In the human being the duct usually ends blindly between the two layers of the broad ligament but occasionally it is continued downwards in the wall of the uterus and vagina; its termination is probably represented by a shallow depression in the vestibule. Attached to the outer extremity of the duct are often seen two or three small cystic bodies which project from the posterior surface of the broad ligament; they are known as 'Kobelt's tubes' and are probably pronephric in origin.

True parovarian cysts develop most commonly in the vertical tubules, more rarely in the duct. They lie between the two layers of the broad ligament and may never attain sufficient size to give rise to clinical manifestations (Fig. 419). They are small translucent cysts with a connective-tissue capsule containing bundles of unstriated muscle. In the early stages of their development they are lined by cubical epithelium, but as they enlarge by the accumulation of fluid the epithelium becomes flattened. Their contents consist of clear fluid with a low specific gravity containing salts and albumen. It is interesting to note that women in whom the paravaginal portion of the duct persists may be the subject of vaginal cysts of Wolffian origin.

Cysts of Kobelt's tubes never attain a large size or give rise to clinical symptoms. As already stated, they are probably pronephric in origin (Fig. 420).

Cysts of the Hydatid of Morgagni.—The hydatid of Morgagni is merely a modified tubal fimbria. Small cysts of this body are common, they are pedunculated, translucent, and contain thin watery fluid of low specific gravity. The wall consists of connective tissue lined by a layer of cubical or flattened cells. There is still some doubt as to the origin of the fimbriated extremity of the Fallopian tube; it is probably a derivative of the pronephros or head kidney, and cysts developed in connection with it are to be regarded as pronephric.



FIG. 420.—The parovarium displayed by removal of the posterior layer of the mesosalpinx. (Doran.)

The pedunculated cyst running forwards from the horizontal tube is probably pronephric. It is connected with the Fallopian tube and represents, according to Keith, the close relations of the pronephros with the Wolffian and Müllerian ducts.

(Royal College of Surgeons' Museum, No. 4586 A.)

Hydrosalpinx of an Accessory Fallopian Tube.—Accessory Fallopian tubes or 'paratubes' are of frequent occurrence; such tubes are small and ill-developed but reproduce in their structure the essential histological features of the Fallopian tube. Some are provided with a miniature but complete ostium opening into the peritoneal cavity; in others the ostium is blind. These accessory Fallopian tubes are of great interest from the point of view of embryology. Francis Balfour has demonstrated that in the shark the tubal ostium is derived from the pronephros. The pronephros is an excretory organ possessing a glomerulus which communicates with the Wolffian duct, three or four tubules and a trumpet-shaped orifice which opens into the body cavity. In the College of Surgeons' Museum is a specimen (Path. Series No. 4586A) showing a small pedunculated cyst connected with both the Fallopian tube and Gartner's duct. This cyst is probably a hydrosalpinx of an accessory Fallopian tube and of pronephric origin; the specimen is of great interest for it exhibits the former close relations of the pronephros with the Wolffian and Müllerian ducts.

From the evidence at present before us it is probable that in the human being the fimbriated end of the Fallopian tube and accessory tubes where present are derived from the pronephros rather than from the Müllerian or Wolffian ducts.

Hydrosalpinx of an accessory Fallopian tube was originally described by Kossman. This subject has been investigated by Handley, who has shown that a specimen of broad-ligament cyst in the Royal College of Surgeons' Museum is a hydrosalpinx of an accessory tube. In the walls of this cyst are plicae and subplical spaces identical with those found in an ordinary hydrosalpinx, and the cavity of the cyst communicates directly with the lumen of the Fallopian tube. These tumours may have a clinical as well as a pathological significance. In 1903 Cullingworth removed by operation a hydrosalpinx of an accessory Fallopian tube which measured $2\frac{3}{4}$ inches in diameter and had caused much pain.

Small cysts formed by dilated lymphatics are common on the surface of the tube in cases of pelvic inflammation. They seldom attain any considerable size or give rise to symptoms. Howard Kelly figures a cyst of this nature as large as a golf-ball.

Fibromata

Fibromata of the ovary constitute 2 per cent of all ovarian tumours; they vary greatly in their anatomical characters and in the symptoms to which they give rise. For purposes of description it is convenient to divide them into three classes: (1) fibromata in which the ovary is entirely replaced by the new formation; (2) fibromata in which the growth is localized to one part of the stroma, leaving the rest of the ovary unaffected except as the result of compression; (3) pedunculated localized fibromata. As most of the fibromata belong to the first group we propose to give a more detailed description of this class of tumour, and to point out briefly the characters which distinguish those of the second and third groups.

1. Fibromata in which the ovary is entirely replaced by the new formation are frequently bilateral, but the growth on one side may have attained greater proportions than that on the other. The tumours are seldom larger than a man's head, and even when of this size the general shape and contour of the ovary are preserved (Fig. 421). The surface is smooth, with elevations and bosses here and there, is dead white in colour, and usually free from peritoneal adhesions or inflammatory change. The tumours are found in the normal situation of the ovary, are pedunculated, and seldom by their growth cause any appreciable separation of the two layers of the broad ligament. The Fallopian tube is not stretched over the surface, as is so commonly the case in the cystomata, and shows no change beyond a slight hypertrophy. The ovarian fimbria remains attached to the surface of the tumour.

The growths are of stony hardness, except where degenerative changes are present. On section they are composed of an interlacing net-work of white tendon-like fibrous tissue. Microscopically the tumour consists of irregular spindle-cells lying between fibrous-tissue bands; the cells vary in number in different parts of the growth. They are usually most abundant in tumours of small size, and in both form and arrangement are indistinguishable from the cells of the normal ovarian

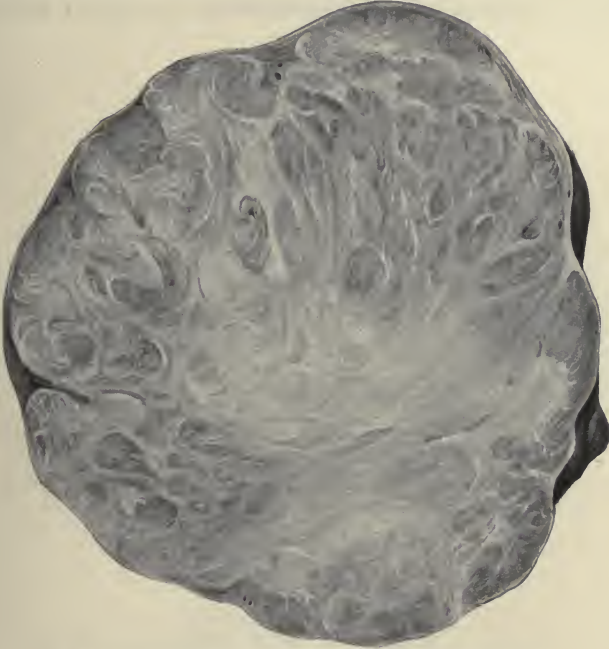


FIG. 421.—Fibroma of ovary undergoing mucinoid degeneration.
The ovary is entirely replaced by the new formation.
(St. Bartholomew's Hospital Museum, No. 2925 D.)

stroma (Figs. 422 and 423). Vascular structures are few; they consist of capillary spaces lined with a definite endothelium, around which the tumour-fibres are often arranged concentrically. Although true muscular walls are lacking, the blood-channels are developed to a far greater extent than in the sarcomata. Degenerative changes are common; myxomatous softening of the tissues may lead to the formation of cystic cavities in the interior of the tumour, deposition of calcareous material is of rarer occurrence, whilst haemorrhages, dilatation of lymphatic spaces, and oedematous infiltration are not uncommon.

In some instances fibrous-tissue bands are absent and the tumour is composed entirely of tissues indistinguishable from those of the normal ovarian stroma. The ovarian stroma is composed mainly of round and spindle cells of the embryonic type, and a tumour built up of such elements is difficult to distinguish from a sarcoma. It is perhaps unfortunate that the term 'fibroma' is applied to these growths; they differ markedly in their histological features from the tumours just described and deserve a special designation. Many of them are innocent—that is to say, after



FIG. 422.—Fibroma of ovary.
Microscopic section. (Low power.)
(St. Bartholomew's Hospital Museum, No. 2925 D.)

complete removal no recurrence has taken place in patients who have been under observation as long as sixteen and eighteen years; but we are sometimes disappointed to find rapid dissemination where histological examination reveals no definite evidence of malignancy; we have had two such cases under observation recently. As we shall point out later, more accurate deductions as to the innocent or malignant nature of the growth may often be drawn from the gross rather than from the microscopic characters.

These solid ovarian tumours are often accompanied by hydroperitoneum and sometimes by hydrothorax; this phenomenon has at present received no adequate

explanation. It is a striking fact that fibromyoma of the uterus, and the encapsuled varieties of ovarian fibromata rarely lead to the accumulation of free fluid in the abdominal cavity, whilst with the growths under discussion ascites is the rule.

2. The second group of ovarian fibromata has been studied by Fairbairn, who has revived a distinction originally enunciated over forty years ago by Virchow. He points out that in some cases we find, not an enlargement of the whole ovary, "but a solid tumour of a connective-tissue type arising within the ovary, and leaving

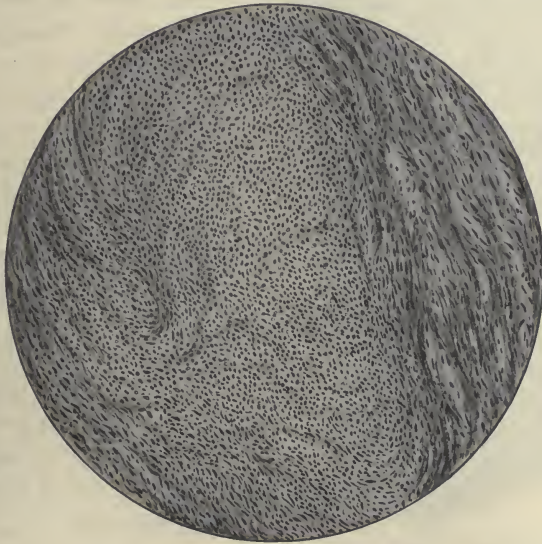


FIG. 423.—Fibroma of ovary.
Microscopic section. (High power.)
(St. Bartholomew's Hospital Museum, No. 2925 D.)

on its outer surface a variable quantity of ovarian tissue as a separate, distinct, and easily recognizable structure (Fig. 424). Where a capsule to the growth can be made out it is continuous with the outer surface of the ovary, and is evidently formed from its tunica albuginea. In some cases the tumour can be separated all round from its ovarian bed, and enucleated from the ovary like a fibroid from the uterus."

These tumours constitute a definite clinical and pathological entity; so far as we know at present they are invariably innocent, and are seldom or never accompanied by ascites.

3. Tumours belonging to the third group of fibromata are of rare occurrence ; they are attached to the surface of the ovary by a distinct pedicle “ like subserous myomata of the uterus.” Such specimens have been described by Virchow, Doran, Keiffer, and others. Sometimes these growths spring from the tunica albuginea,

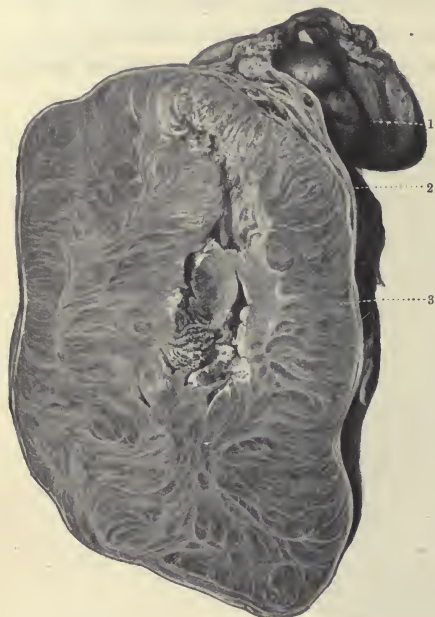


FIG. 424.—Encapsulated fibroma of ovary.

1, Ovary proper ; 2, capsule of ovarian tissue ;
3, fibroma.

(St. Bartholomew's Hospital Museum, No. 2925 A.)

sometimes they undergo part of their development in the ovary, and become extruded from the surface. The different forms of ovarian fibromata do not represent stages in the growth of one variety, for no matter what size the tumour attains, the distinctive characters are still evident.

Ovarian fibromata are found at widely different periods of life ; Beyea mentions an instance in a child of eight, but we have found no well-recorded cases in which the patient was younger than twenty ; large fibromata have been removed from women over seventy. The rate of growth is difficult to ascertain ; in one case four years were occupied by a tumour in increasing from the size of a hen's egg to that of a man's head.

Adeno-fibromata

These rare tumours resemble in general characters those we have just described, but present a more porous appearance, and contain cystic cavities lined by a definite epithelium consisting of cylindrical or cubical cells. These adenomatous formations may undergo a colloid change, the epithelial cells degenerating, and the lumina containing a striated homogeneous material. In other instances cancer may develop in them, the epithelial cells proliferate, assume atypical forms, and invade the fibrous stroma. In these growths curious vesicular cells, somewhat resembling ova, are sometimes found. The significance of these cells is discussed in the section on histogenesis.

Myomata and Fibromyomata

Both forms of tumour are rare, and probably have their origin in the ovarian ligament rather than in the ovary itself. Doran has described a pure myoma "the size of a small potato." We have never seen a specimen.

Fibromyomata are occasionally seen; they consist of smooth interlacing muscular bundles separated from one another by loose connective tissue. If treated by van Gieson's stain the distinction between the muscular and connective-tissue elements is clearly displayed.

MALIGNANT TUMOURS OF THE OVARY

New growths of the ovary may be primarily malignant or a tumour at first innocent may subsequently assume malignant characters. We shall avoid the terms 'malignant degeneration,' for 'degeneration' implies a loss of vitality leading through slow or rapid gradations to ultimate death, whereas 'malignancy' implies an activity and vitality so great that along the tract of the invading cells the normal tissues are disintegrated and destroyed. We know nothing of the process by which an innocent is converted into a malignant tumour; we do not know whether cells originally innocent assume malignant characters or whether the cancer originates from cells which form special characteristics *ab initio*.

The type of cell may be epithelial and the growth carcinomatous, or it may be connective tissue and the growth sarcomatous, but tumours are met with which contain both types of cell, the combined carcinoma and sarcoma.

The malignant growth may arise primarily in the ovary or may be secondary to growth pre-existing in some other part of the body, most commonly the intestinal tract.

Carcinoma of the Ovary

Primary carcinoma of the ovary is seen sometimes as a solid tumour and sometimes as a tumour partly solid and partly cystic. The solid tumours are malignant from the first; they may have their origin in the surface-epithelium, in the epithelium lining the follicles, or in the Wolffian structures so frequently present in healthy ovaries. The study of the cystic tumours is beset with difficulties: some are secondary to cancer in other parts of the body, notably in the intestinal tract; in others the cancer arises in tumours which appear to be primarily, innocent adenomatous, papillomatous, or teratomatous cysts; whilst in some cases the cystic tumour is

malignant from the first. It is often impossible to state whether a given tumour is primary or secondary.

Our knowledge is not sufficiently complete to enable us to devise a satisfactory classification of ovarian carcinomata, but we shall describe the following groups :

1. Solid carcinomata.
2. Cystic carcinomata.
 - (a) Of the type of an adenomatous cyst.
 - (b) Of the type of a papillomatous cyst.
3. Malignant teratomata.
4. Carcinomata composed of tissue resembling that of the thyroid gland.
5. Neuro-epitheliomata.
6. Chorionepitheliomata.

It is still an open question whether malignant tumours composed of lutein cells should be included amongst the carcinomata ; if the origin of the lutein cell be epithelial they should be included, but if, as we believe, lutein cells are of connective-tissue origin, they should be placed amongst the sarcomata.

1. Solid Ovarian Carcinoma

Massabuau and Etienne¹ have collected 250 cases of solid ovarian carcinomata, and most of the statistics quoted in the following paragraphs are taken from their article. Our knowledge of primary carcinoma of the ovary is very imperfect, partly because of the difficulty of distinguishing between primary and secondary growths, and partly because of the tendency of adenomatous and papillomatous tumours, originally innocent, to undergo malignant change and to give rise to metastases.

Etiology.—Frequency.—The statistics published by Schmidlechner from the Budapest clinic show that out of 50,000 patients 720 were operated upon for ovarian tumours. Of these 720 tumours 147 were malignant. In 112 cases only was a satisfactory microscopical examination made, and of these 35 proved to be solid carcinomata, 60 cystic carcinomata, and 27 sarcomata.

Age.—Primary carcinoma has been found at all periods of life between four years and extreme old age. It is rare before puberty, most common between the ages of twenty-five and forty-seven, and comparatively rare after sixty. Thus it is most frequent during the years of active sexual life.

Child-bearing.—The incidence is not affected by child-bearing, the disease being equally common amongst the married and the unmarried. In the rare cases in

¹ *Rev. de gyn. et de chir. abd.*, 1913, vol. xx. p. 225.

which the cancer has been present during gestation the pregnancy has run a normal course.

Morbid Anatomy.—The growths may be unilateral or bilateral. Dartigues found them bilateral in 12 and unilateral in 15; Massabuau and Etienne report a series in which 70 were bilateral and 81 unilateral. It is probable that in the earlier stages one ovary only is affected, and that the second ovary subsequently becomes involved from spread of the growth. It must be remembered that the condition of the second ovary can be determined only by microscopical examination; an organ normal as far as its naked-eye characters are concerned may nevertheless be the seat of a malignant growth.

The tumours present a variety of forms: some are smooth and regular in outline, others are irregular and bossed; on section the bosses may be either solid or cystic (Fig. 425). The size of the tumour seldom exceeds that of a man's head. The colour varies with the thickness of the capsule, the degree of cystic change undergone, and the amount of blood extravasated into the tissues; it may be dead white, blue, or pink. Some growths are hard and firm, others softer and almost brain-like, hence solid carcinomata are often described as belonging to the scirrhus or encephaloid type. The consistence depends upon the amount of connective tissue they contained, and upon the amount of oedematous infiltration or cystic degeneration they have undergone. The tumours are enclosed in a white fibrous capsule from $\frac{1}{8}$ to $\frac{3}{4}$ of an inch in thickness; the capsule may have contracted adhesions to neighbouring viscera, or may have been perforated by the growth. The consistence is sometimes firm and sometimes soft, in some parts solid, in others showing areas of degeneration, varying in colour according to the quantity of extravasated blood. Degeneration may have advanced to such a degree as to lead to the formation of cystic spaces with fluid contents; the walls of these spaces are devoid of an epithelial lining and consist of broken-down degenerate growth; such 'false cysts' must be distinguished from the small epithelial-lined 'true cysts' occasionally found in these growths.

The tumours are usually pedunculated, more rarely intraligamentary; when small they occupy the pelvis, when large they usually lie above the pelvic brim; adhesions, both inflammatory and neoplastic, are common in connection with the large or small intestine, the mesentery, bladder, uterus, and parietal peritoneum. Torsion of the pedicle is rare, probably on account of the adhesions and of the irregular shape of the growth.

The ovary of the opposite side is almost invariably affected sooner or later. It may become involved by direct spread of the growth, by permeation through the

Fallopian tube and uterus, or by infection from peritoneal growths. Glendinning has shown that in the Fallopian tube the growth may spread both by the mucosa and by the lymphatics. The uterus is often displaced by inflammatory changes and by extension of the growth; occasionally its mucosa is the site of a carcinoma, and it may be difficult to decide whether the ovarian or the uterine growth should

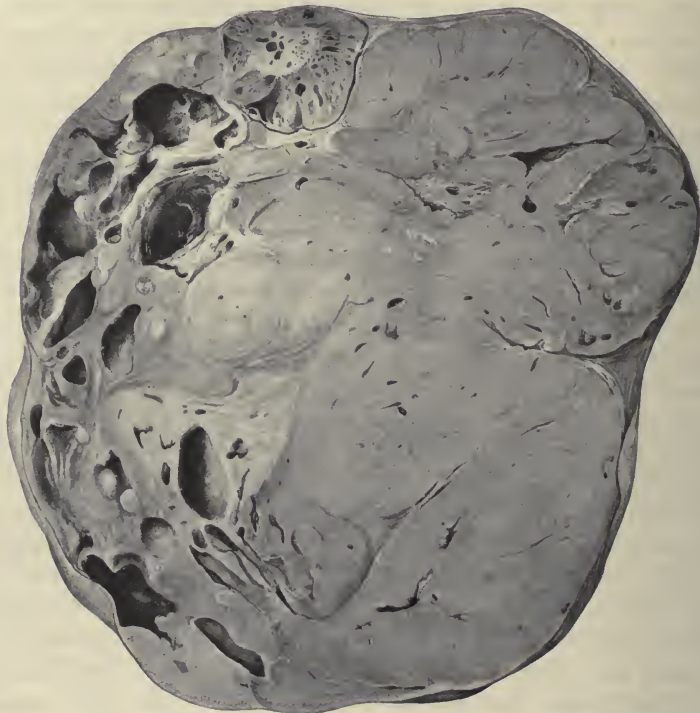


FIG. 425.—Primary solid alveolar carcinoma of the ovary, showing cystic degeneration.
(St. Bartholomew's Hospital Museum, No. 2926 A.)

be regarded as primary. The second ovary is most often involved by direct spread, and possibly offers less resistance than surrounding structures, because, unlike them, it is devoid of a peritoneal covering.

Lymphatic Involvement.—The published records are singularly incomplete with regard to the condition of the lymphatic glands. In the majority of cases no mention is made of them, but this fact must not be taken to imply that they were free from cancerous deposits. The lymphatics from the ovary drain into the lumbar

and renal glands and into the small accessory glands which lie along their path ; further, the ovarian lymphatics do not form an isolated system, but anastomose freely with the lymphatics of the uterus, hence we find deposits in some instances in the iliac as well as the lumbar and renal glands. Where complete investigation has been made, glandular involvement has usually been found, and must be regarded as an early phenomenon. Growths in the intestine are common ; in some instances they are the result of direct spread from the ovarian growth, in other cases they are found as separate and distinct growths. It is possible that a primary intestinal

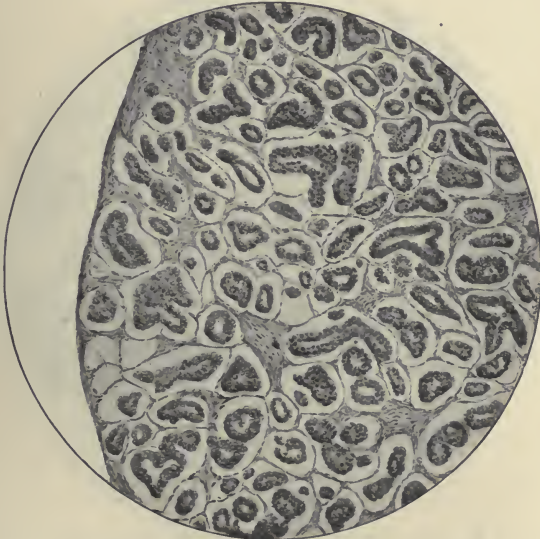


FIG. 426.—Primary alveolar carcinoma of the ovary.
Microscopic section (low power) from the tumour represented in Fig. 425.

and a primary ovarian growth may coexist, but more often the one is secondary to the other, and whether the intestinal or ovarian growth is primary is often difficult to determine. The decision must be based partly upon the histological characters of the cells and partly upon their biochemical reactions : cells derived from the intestinal epithelium are stained with mucicarmine, those derived from ovarian epithelium are not.

Ascites is present in more than 50 per cent of the cases. The amount of fluid varies from a few ounces to many pints. It may be a pale straw colour or a deep orange ; it is sometimes blood-stained. Cytological examination shows the presence of epithelial cells, polymorphonuclear-leucocytes (20 per cent), and lymphocytes

(30 per cent). The fluid is an exudation from either the peritoneum or the tumour itself. Ascites sometimes occurs where no peritoneal metastases are present. As a rule the bladder and ureters are not involved; the renal epithelium often exhibits degenerative changes, and rarely may be the seat of secondary deposits. Metastases in the liver are not uncommon, in the lungs rare.

Summary.—In studying the natural progress of these tumours two facts must be borne constantly in mind. First, the growth is intraperitoneal and tends to

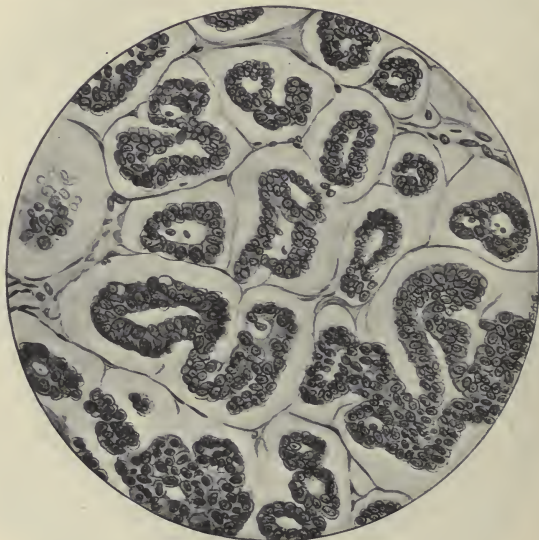


FIG. 427.—Primary alveolar carcinoma of the ovary.
Microscopic section (high power) of the tumour represented in Fig. 425.

become widely diffused within the peritoneal cavity, and secondly, the lymphatic glands are involved early.

The spread of the growth may be divided broadly into three stages—local, regional, and general. The ovary enlarges, the ovarian tissue is replaced by growth and eventually destroyed, whilst in places the cancer-cells degenerate and cystic spaces are formed. At first the tumour is encapsuled, but at an early stage nodules of growth penetrate the capsule; subsequently the lymphatic glands of the lumbar and iliac regions are soon involved; adhesions, at first inflammatory, form around the mass, but later are invaded by the growth which thus spreads to neighbouring viscera; the opposite ovary is usually involved early. Eventually the cancer-cells pass

beyond the lymphatic glands to enter the blood-stream, and the growth becomes generalized.

Microscopical Characters of the Growth.—The histological appearances of carcinomata of the ovary, like those of the testicle, vary within wide limits. We shall describe three types: (i.) Alveolar carcinoma; (ii.) Columnar-celled diffuse carcinoma; (iii.) 'Clear-celled' carcinoma.

(i.) *Alveolar carcinoma* is the type most commonly found in cancerous growths of the ovary. The malignant cells are divided into discrete masses by connective-

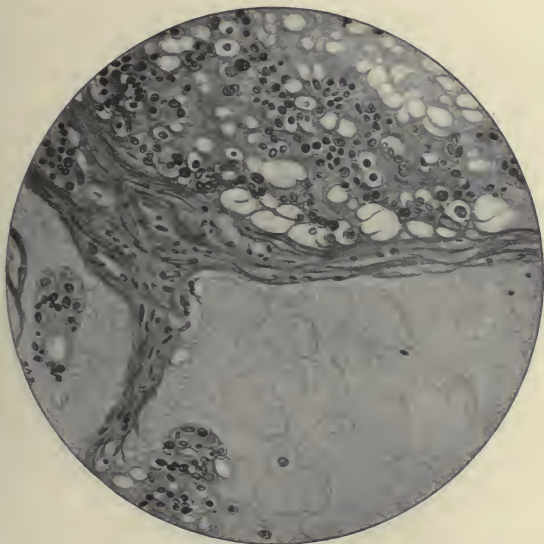


FIG. 428.—Secondary alveolar carcinoma of the ovary undergoing colloid degeneration; the primary growth was in the sigmoid flexure. (Low power.)

tissue septa. The individual cells are polygonal, but owing to their active proliferation show the variations in size and form which we term 'anaplasia.' Sometimes the cell-masses are arranged in the form of tubules, sometimes in the form of solid columns (Figs. 426 and 427). The connective tissue may be scanty as in the encephaloid type, or form wide dense septa as in the scirrhus variety; it is prone to degenerate, and if the degeneration be marked, the myxomatous form described by von Kahldein is produced (Figs. 428 and 429). Areas of degeneration, of necrosis, and of haemorrhage form striking features of these tumours. The connective-tissue cells in the neighbourhood of the growth show marked proliferation, so that it is

often difficult to distinguish tumours exhibiting this connective-tissue reaction from the combined carcinomata and sarcomata occasionally found in the ovary, especially as the giant-cells so characteristic of connective-tissue tumours have been described by Glockner¹ in ovarian carcinomata. Orthmann, Fothergill, and others have directed attention to the occasional presence in these tumours of egg-like cells with a nucleus resembling that of the primordial vesicle; the presence of the cells has led many pathologists to ascribe a follicular origin to these tumours; this point is further discussed in the section upon histogenesis.

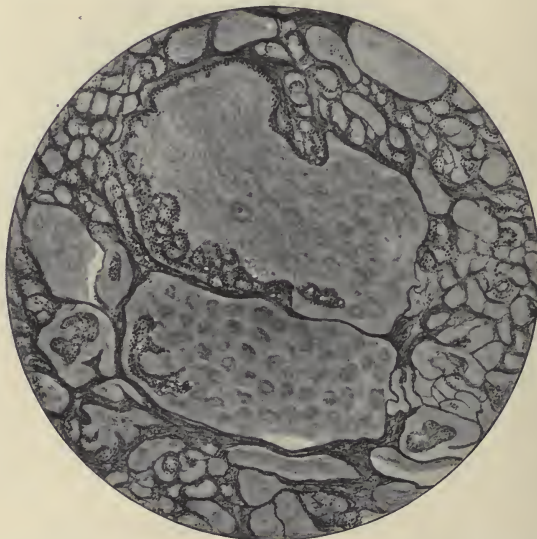


FIG. 429.—Secondary alveolar carcinoma of the ovary undergoing colloid degeneration; the primary growth was in the sigmoid flexure. (High power.)

(ii.) *The diffuse Columnar-celled Type*.—This variety is less common than the alveolar form. The cells are columnar, irregular in outline, and show evidence of rapid proliferation; they form scattered masses or rods, and within the cell-masses are small cystic spaces lined by carcinoma-cells. The epithelial lining is several cells deep, the innermost layer is tall and columnar, the outer layers are polyhedral. The cells of the rods proliferate and send out branching processes which surround for a time islands of connective tissue; these islands eventually degenerate, so that the branching processes enclose a small lumen which may be empty or may be

¹ *Lehrbuch der Geb. und Gyn.* vol. lxxiv.

occupied by broken-down cells, mucus, or colloid material (colloid cancer). In some instances the lumen is large, and proliferating masses of carcinoma-cells project into it. The tumours so produced must not be regarded as adenomatous growths which have assumed malignant characters, and must be distinguished from the pseudo-mucinous multilocular cysts which occasionally show malignant overgrowth.

(iii.) *Clear-celled Carcinoma*.—This type was first described by Chenot in 1911. It is an alveolar growth with connective-tissue elements, composed of delicate strands encircling the masses of cancer-cells. The carcinoma-cells are of large size, polygonal in shape, with a clearly defined but often irregular outline. The nucleus is centrally situated and elongated or oval in form; the cell-protoplasm is clear, and contains many vacuoles, in some of which glycogen may be detected. The nature of these cells is uncertain. Chenot regards them as identical with cells of a similar appearance found in testicular growths, and believes that they arise from the germinal epithelium; Massabuau and Etienne,¹ on the other hand, maintain that they have nothing in common with the testicular cells, and state that similar cells are found in cancers in other parts of the body, such as the kidney and breast. These cells were found by them in a carcinoma of the ovary, secondary to a columnar-celled carcinoma of the uterus.

2. Cystic Carcinoma

Carcinoma may arise in cysts of either glandular or papillary type. The carcinoma preserves the form and shape of the cyst in which it originates. The contents of the loculi may be clear, or may resemble pus; from the large quantity of cells mixed with the fluid if haemorrhages have occurred, different degrees of pigmentation are seen. As the malignant growth progresses the cyst-wall is perforated, the cancer spreads to adjacent organs, and metastases are found in various parts of the abdominal cavity.

Carcinoma developing in glandular cysts arises from an atypical proliferation of the cyst-epithelium; the columnar cells lining the carcinomatous alveoli become stratified, or form proliferating masses which project into the gland-lumina, sometimes to such an extent as to obliterate them altogether; at the same time they invade the connective-tissue stroma of the wall and the septa of the loculi in the form of masses and nests of cells which destroy and replace the tissues as they advance.

Carcinoma of the papillary cystic type (adenocarcinoma papillare) is perhaps

¹ *Rev. de gyn. et chir. abd.* vol. xx. p. 275.

the commonest form met with in the ovary (Fig. 430). It has already been pointed out in the section upon papillomatous cysts how the group of tumours stands upon the border line between innocence and malignancy, and it is not surprising that its members should sometimes exhibit the characters of true carcinomata.¹ The



FIG. 430.—Cystic carcinoma of the ovary. (Papillary type.)
(St. Bernard's Hospital Museum, No. 2926 A₁.)

change is at first often exhibited over only a limited area, and may easily escape observation (Fig. 431). The cells multiply irregularly, the basement membrane is broken through, and the stroma invaded. The growth soon spreads to neighbouring structures, and metastatic deposits are carried by both the blood- and the

¹ According to Pfannenstiel 50 per cent of the papillary tumours are either originally malignant or become so.

lymph-streams. The cancerous transformation of the epithelial cells is sometimes accompanied by a sarcomatous change in the stroma-cells. The cancerous growths resemble the innocent tumours, but the solid masses develop out of proportion to the size of the cyst, and are often softer and more irregular than in the benign tumours. Secondary growths are found most commonly in the omentum, peri-



FIG. 431.—Cystic carcinoma of the ovary. (Papillary type.)

Microscopic section (low power) showing the junction of (1) innocent with (2) malignant type of cell.

toneum, the ovary of the opposite side, the tubes and uterus, and the lumbar and iliac glands. Clinically, ascites is a marked feature.

3. **Malignant teratomata** are described on page 796.

4. **Carcinomata** composed of tissue resembling that of the thyroid gland are described on page 782.

5. Neuro-epitheliomata

A case of ovarian tumour, apparently of the nature of a neuro-epithelioma, has been recorded by Gosset and Masson.¹ It was removed without difficulty from a woman aged fifty; eight months afterwards the patient returned with

¹ *Rev. de gyn. et de chirurg. abd.*, January 1913.

signs of generalized malignant disease of the abdomen. No post-mortem examination was obtained. The tumour was partly solid and partly cystic. The solid portion was made up of cell-masses separated by spaces lined by several layers of cells. These cells appeared to the authors to be epithelial in nature, and identical with those found in the nervous system of the early embryo. Scattered

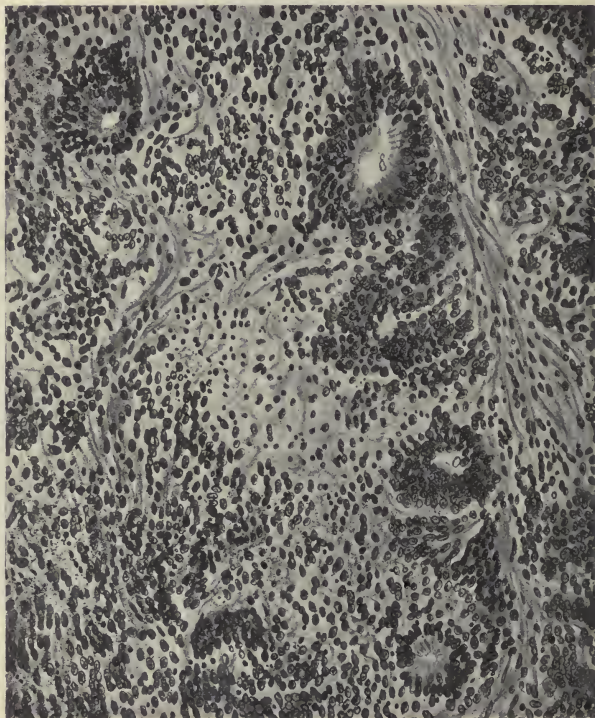


FIG. 432.—Microscopical section of primary neuro-epithelioma of the ovary, showing cystic spaces lined by several layers of epithelial cells resembling those of the ependyma of the brain.

(Gosset and Masson.)

through the tumour were small cysts the size of a pea; these cysts possessed a lining resembling the ependyma of the brain. Tumours composed of nervous tissue may be divided into two groups—those derived from the central nervous system and those derived from the sympathetic. In both varieties cells are present and possess processes like nerve-fibres; the cells are multipolar and contain Nissl's granules. The tumour described was regarded as derived from the sympathetic.

6. Chorionepitheliomata

The ovary is occasionally the site of the primary growth in cases of chorionepithelioma. This fact was recognized by Pick in 1904; previously to the publication of his work, chorionepitheliomata of the ovary were regarded as always secondary to growths in the uterus or Fallopian tube. The general features of this

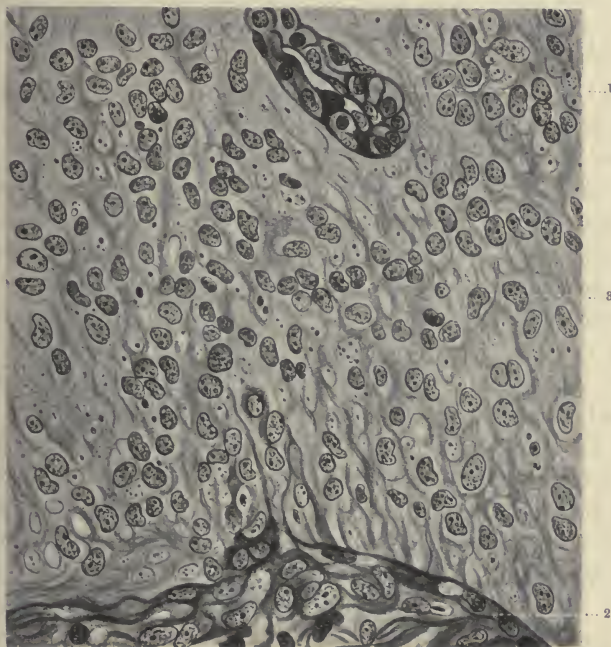


FIG. 433.—Microscopical section of primary neuro-epithelioma of the ovary, showing: 1, capillary invaded by embryonic cells; 2, connective tissue invaded by similar cells; 3, ovular-shaped nuclei surrounded by ill-defined cytoplasm. (Gosset and Masson.)

group of tumours are described in another part of this volume, and we shall therefore omit histological details.

We may divide ovarian chorionepitheliomata into two groups: in the one group the malignant growth clearly arises from the tissues of an embryoma, and in some part of the tumour we can demonstrate the imperfectly differentiated foetal tissues so characteristic of the embryomata; in the second group other foetal elements are absent, and the tumour consists solely of chorionepitheliomatous elements.

The pure chorionepitheliomata are composed of large clear cells containing glycogen and resembling closely the cells of Langhans, and of syncytium in the form of masses and strands of multinucleated protoplasm not divided into cells. These elements are grouped around the vessels and around blood-spaces formed as the result of tissue destruction. The origin of these tumours is doubtful—four theories are worthy of consideration :

1. Pick and Klotz regard them as embryomata in which the majority of the tissues have been suppressed at an early stage of development and one type of tissue only has survived.

2. It is held by some that they result from an ovarian gestation. We know that gestation occasionally occurs in the ovary, and it is interesting to find that in several cases of chorionepithelioma a period of amenorrhoea has preceded the onset of symptoms. It is true that in ovarian gestation the embryo usually perishes at an early stage, but it is conceivable that even if the ovum dies, portions of chorionic epithelium may survive, and at a later date give rise to a malignant growth.

3. The tumours may arise from portions of chorionic epithelium which have entered the blood-stream and been carried to the ovary. The phenomena of 'deportation of villi' are familiar to us, and when we call to mind the free anastomosis between the uterine and ovarian vessels it is not surprising that detached portions of villi should find their way to the ovary.

4. The fourth view is that the chorionepitheliomatous structures are formed by the modification of the cells of certain ovarian carcinomata which frequently show areas of degeneration and haemorrhage. The presence of giant-cells in ovarian carcinomata has often been observed ; these cells may attain large dimensions and resemble masses of plasmodium, they are multinuclear, the nuclei varying in shape and in size. The nature of these cells is uncertain : Glockner suggests that they represent cancer-cells in which the nucleus has divided so rapidly that the cell-substance has been unable to keep pace ; Arnold, on the contrary, regards them as formed by the fusion of several degenerate cells. It is claimed¹ that in both ovarian and testicular carcinomata the gradual transition of the cancerous element to the chorionepitheliomatous type has been actually observed.

Sarcomata

Frequency.—Primary sarcoma of the ovary is one of the rarer forms of malignant growth. Reliable statistics as to its frequency are difficult to obtain, but Stander has published a careful study of a series of cases ; he found that in a period of thirteen

¹ Massabau et Étienne, *l.s.c.* p. 281.

years 295 cases of ovarian tumour were operated upon in the clinic at Würzburg ; of these, 20 proved to be sarcomata, 6 of which were of the type of endothelioma. Thus in this particular hospital 6·7 per cent of ovarian tumours removed were sarcomata. More recent statistics correspond closely with Stander's, and it is probable the sarcomata constitute from 6 to 7 per cent of ovarian tumours.

Age.—Sarcoma of the ovary often occurs at an earlier age than carcinoma, but no period of life is exempt ; it is found in childhood, in youth, and in old age.



FIG. 434.—Primary mixed-celled sarcoma of the ovary.
(St. Bartholomew's Hospital Museum, No. 2927 B.)

The greatest number of cases are met with about the age of puberty ; the incidence is less during mature sexual life, but rises again after the menopause. Sarcomata constitute about 30 per cent of ovarian tumours occurring in girls under fifteen, and in these young subjects are usually of the round-celled type and intensely malignant.

The growths may be unilateral or bilateral. The most recent statistics show that in 53 per cent of cases they are bilateral. The two ovaries may be affected simultaneously, or a considerable period may elapse before the second ovary shows signs of disease.

Morbid Anatomy.—The tumours vary in size and may attain enormous proportions, sarcomata weighing 80 and 90 pounds having been described ; it is common in practice for them to attain a size as large as a child's head before they cause symptoms sufficiently severe to lead the patient to seek advice. They are rounded or oval in form and are usually pedunculated ; at first they possess a capsule formed of the *tunica albuginea* but in the larger growths this can seldom be demonstrated (Fig. 434). The surface is sometimes smooth and sometimes irregular from the presence of projecting bosses ; large veins are often seen ramifying over it. The spindle-celled

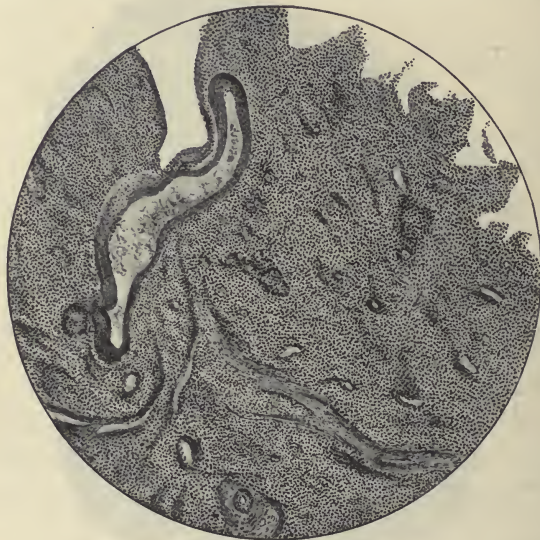


FIG. 435.—Primary round-celled sarcoma of the ovary. (Low power.)

growths are hard and firm, resembling in their general characters the fibromata, but their consistence is not so uniform ; the round-celled growths on the contrary are softer and more brain-like, they are often pigmented, and on section show haemorrhages into the tissues, areas of softening, and cyst-like cavities.

It must be remembered that mixed forms are found, that in both varieties the relative amounts of cellular and fibrous tissue vary, and that in either form myxomatous degeneration may lead to softening and cyst formation.

Microscopic Examination.—The *spindle-celled sarcomata* are characterized by the large amount of fibrous tissue they contain ; the fibrous tissue is seen in the form of interlacing strands and bundles, and between the bundles lie groups of spindle

cells with nuclei rich in chromatin and varying in size and form. The microscopic appearance of these tumours often bears a marked resemblance to the normal ovarian stroma and diagnosis is therefore difficult; they can, however, usually be distinguished by the large number of cellular elements, by the marked variations in size and form exhibited by the nuclei, and by the fact that the cells are collected into groups often in the neighbourhood of the lymphatic vessels. Spindle-celled sarcomata are usually found in elderly women; they are less malignant than the round-celled variety and less prone to recur after removal.

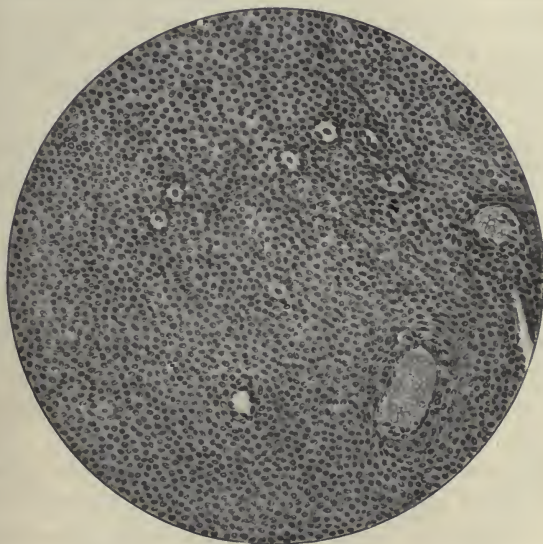


FIG. 436.—Primary round-celled sarcoma of the ovary. (High power.)

The *round-celled sarcomata* are vascular tumours; they are composed of closely packed small round cells with relatively large nuclei which stain deeply, and are surrounded by clear protoplasm. The cells are separated from one another by a delicate intercellular stroma which is sometimes arranged round groups of cells in such a manner as to give them an alveolar appearance. Scattered through the growth large giant-cells may sometimes be seen, some possessing two or more nuclei often in a state of active division. Not infrequently we find lymphatic vessels crowded with round cells permeating the stroma of the tumour; sometimes collections of sarcoma-cells are found on peritoneal surfaces in contact with the tumour. The round-celled growths are very prone to degeneration and haemorrhage within the

degenerate area. They are intensely malignant, early infect the lymphatic gland, and give rise to metastases; as has been stated previously, they are most commonly found at the commencement of sexual life.

Melanotic Sarcoma.—Secondary deposits of melanotic sarcoma are frequently found in the ovary, and it may be the seat of the primary growth as in a case recorded by Russell Andrews. Rab, who has collected 35 cases of melanotic sarcoma, regards the ovarian growth as the primary lesion in a considerable proportion of them.

Clinical Features.—Clinically sarcoma is difficult to distinguish from other forms of malignant disease of the ovary. Ascites is a common phenomenon and is present in about 50 per cent of the cases; pleural effusions usually indicate the presence of secondary growths in the lungs. Fixation of the tumour occurs at a later stage than in the carcinomata because the tumours possess a false capsule formed of stretched albuginea and ovarian stroma. Abdominal pain and loss of flesh are early symptoms. Secondary growths, notably in the liver and lung, are common, and the lumbar lymphatic glands are usually infected. The growth spreads to surrounding structures by direct implantation, and emboli of sarcoma-cells are carried by both the blood- and lymphatic streams.

Sarcomatous Tissue in the Wall of the Ovarian Cysts.—Sarcomatous tissue is occasionally found in the walls of adenomatous, papillomatous, or embryonal cysts. Taylor has described 2 such cases and has collected 15 other from the literature. Debrechy has published an account of embryonal cysts containing sarcomatous tissue in their walls.

Sarcoma combined with Carcinoma.—A few instances have been recorded of combined sarcoma and carcinoma in the same ovary; the tumours are intensely malignant and grow rapidly. Cullen has reported a case of adenocarcinoma combined with a mixed-celled sarcoma in which the spindle cells predominated. The patient was a single woman, aged fifty, who sought advice because of pelvic pain; the pelvis and hypogastrium were filled by a hard tumour. At operation the left ovary was found to be the seat of a tumour measuring six inches in diameter; the growth recurred within a few weeks and the patient died eleven months after operation. The primary growth proved to be a combined sarcoma and carcinoma, the recurrent growth was mainly sarcomatous in character, whilst the secondary growths (which were confined to the peritoneal cavity) were pure carcinomata.

Endothelioma and Perithelioma are varieties of sarcoma in which the malignant growth arises in the walls of blood- or lymphatic vessels, from the cells either of the endothelial lining or of the adventitia.

The tumour may be entirely solid or partially cystic; its consistence may be

soft or firm, its surface may be smooth or nodular. Sometimes the tumours are



FIG. 437.—Ovarian cyst, the wall of which contains sarcomatous tissue.

(St. Bartholomew's Hospital Museum, No. 2927 C.)

unilateral, sometimes bilateral, and occasionally are combined with other growths—cysts or embryomata. They are very malignant, and after removal recurrence or

dissemination takes place rapidly. Microscopically the endotheliomata are composed of cells resembling those of the endothelial lining of blood- or lymph-vessels; the malignant cells become cubical, spheroidal, or squamous in form, and large multinucleated giant-cells are sometimes seen. Cell-columns grow out into the surrounding connective tissue in the form of tubular and cone-like masses. This mode of growth gives a distinctly alveolar appearance to the microscopic sections. In the

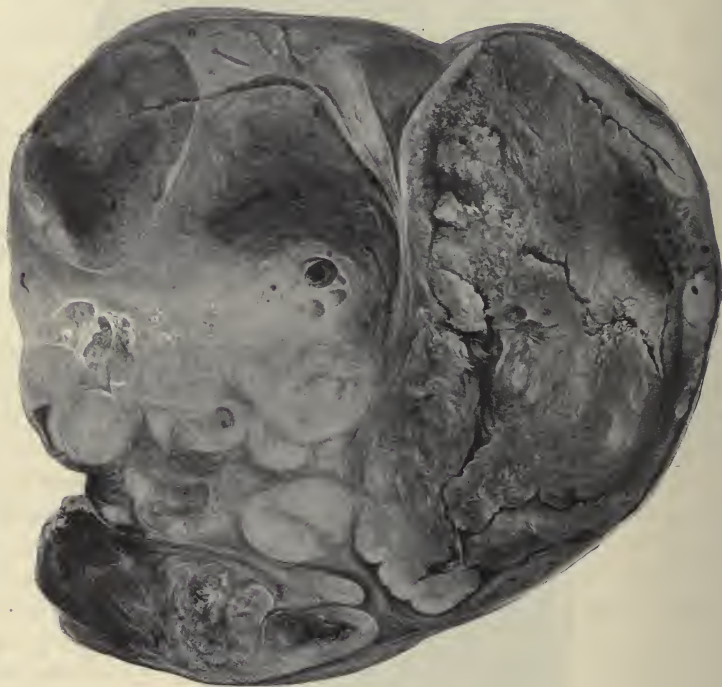


FIG. 438.—Perithelioma of the ovary.
(St. Bartholomew's Hospital Museum, No. 2926.)

later stages proliferation has occurred so rapidly that the alveolar structure is lost, and the typical picture of a round-celled sarcoma is produced.

Perithelioma arises from the adventitia of the blood-vessels or from the perivascular lymphatics; the vessel becomes surrounded by a mass of small round cells, which encroach upon its lumen and invade the surrounding connective tissue. Many vessels are simultaneously affected so that rounded masses of cells are produced, separated from one another by strands of connective tissue, which are

ultimately invaded and destroyed. Both groups of tumours commonly undergo degenerative changes—necrotic and myxomatous.

Malignant Tumours composed of Cells resembling those of the Corpus Luteum¹

Malignant tumours composed of lutein-like cells are occasionally found in the ovary. Whether they should be regarded as carcinomata or sarcomata must depend upon the view taken of the origin of the lutein cell. If, as we believe, lutein tissue is derived from modified ovarian stroma-cells, malignant tumours arising from it should be classed amongst the sarcomata. The tumours are rare; we have been able to collect only 9 recorded cases. The earliest was described by Rokitansky in 1859 under the name of 'carcinoma of the corpus luteum,' but the histological details are very incomplete. Maffucci has also described under the name 'adeno-sarcoma of the ovary' a tumour which probably belongs to this group.

In Voigt's case a tumour the size of a man's head developed during pregnancy. It was surrounded by a capsule formed of ovarian tissue and was composed of a central necrotic area surrounded by a peripheral zone of cells having the appearance of lutein cells, some of which were multinucleate. Voigt was by no means certain as to the nature of the cells, and thought the tumour was probably a perithelioma.

In Schaller and Pforinger's case the tumour developed in a woman of thirty-two who had recently been delivered of a vesicular mole. The tumour formed a lobulated mass resembling a bunch of grapes and was composed of multiple lutein cysts; in the wall of some of the cysts the cells were actively proliferating and had invaded and destroyed the ovarian stroma.

Grousdew's case is a particularly interesting one (Fig. 439). The tumour was composed of three peripherally placed cysts and a central solid portion; one cyst had the characters of a pseudo-mucinous adenoma, the other two were lined by lutein cells. The solid portion was composed of large lutein cells originally grouped round the corpora albicantia but eventually invading and destroying them. The masses of lutein tissue showed areas of degeneration with cyst-like cavities in their centres. Grousdew regarded the two lutein cysts as formed in this way.

Savage's patient was aged thirty-eight and had been a widow for ten years.

¹ Alamartine et Maurizot, "Hypernéphromes génitaux," *Revue de Gynécologie*, janvier 1912; Grousdew, "Beitrag zur Frage der proliferierenden aus luteinzellen bestehenden ovarial Geschwülste," *Archiv für Gynäkologie*, 1903, t. 70; Markovitch, *Tumeurs de l'ovaire à cellules luteiniques*, 1913; Massabauau, *Tumeurs de l'ovaire à cellules luteiniques*; Schalle et Pforinger, "Zur Kenntniss der vom Corpus luteum ausgehenden Entbildungen," *Beiträge zur Geb. und Gyn.* t. 2; Smallwood Savage, "Malignant tumour of the corpus luteum," *Brit. Med. Journal*, October 1909; Voigt, "Fall von Kaiserschnitt nach Porro in der Schwangerschaft wegen malignen Ovarialtumor nebst Beitrag zur Pathologie des Corpus luteum," *Arch. für Gyn.* t. xlix.

At operation he found solid bilateral tumours, the right the size of a foetal head, the left the size of a walnut. The peritoneal cavity contained much free fluid. The patient died from recurrence within two years of the operation.

From a study of the cases we may draw the following conclusions. Most of the tumours occurred in patients between thirty and fifty years of age, but Grousdew's patient was sixty. Three of the patients had passed the menopause. Sometimes the tumours developed in association with a recent pregnancy, in other instances there had been no pregnancy for many years. The tumours may be unilateral or bilateral, solid or cystic, but when cystic cavities are present they are probably



FIG. 439.—Malignant tumour of the ovary composed of cells resembling those of the corpus luteum. (Grousdew's specimen.)

formed by degenerative changes in solid masses of cells. They vary in size and may attain the dimensions of a man's head; they are usually pedunculated and occasionally lobulated. They are intensely malignant, rapidly giving rise to metastases and to implantation growths with the abdominal cavity. They tend to recur after removal. Clinical diagnosis is difficult, ascites is often present, pain and wasting are marked features, but the tumours can be distinguished from other varieties of malignant growth of the ovary only by microscopical examination.

Histologically they are composed of cells resembling those of the corpus luteum and of the cortical zone of the suprarenal gland. The size varies—some are large and multinucleate, others smaller with a centrally situated single nucleus, the shape is polygonal, and sometimes the outline is irregular. The cell-protoplasm is granular

and vacuolated; the vacuoles contain drops of a substance which dissolves in xylol and is stained by osmic acid and by Sudan iii. This substance is a lipid and belongs to the group of the lecithins. The cells, which are often grouped in large masses traversed by connective-tissue septa, tend to degenerate so that the solid nodule is transformed into a cyst-like cavity with fluid contents bounded by a wall of lutein cells. In the centre of the nodules we not infrequently find a vessel engorged with blood from which columns of lutein cells radiate in much the same way as the liver-cells radiate from the intralobular vein.

Origin of the Tumours.—Three views have been held: (a) that the tumours arise from aberrant suprarenal glands, (b) that they arise from the corpus luteum, (c) that they arise from the interstitial cells of the ovary.

(a) *The Suprarenal Origin.*—Aberrant suprarenal glands of the broad ligament are not uncommon. Aschoff and Meyer found them in 12 per cent of women. They are seldom found in the ovary proper but are usually situated in the mesovarium, they are easily enucleated, are reddish or yellow in colour, and are composed of cortical suprarenal cells only. In 1912 Alamartine and Maurizot collected ten cases of genital hyponephromata which in all respects resembled the hypernephromata frequently found in the region of the kidney. It is not improbable that the cases of Voigt and Grousdew were of this nature.

(b) *The Corpus Luteum Origin.*—The structure and arrangement of the cells of the corpus luteum resemble closely those of the cortex of the suprarenal gland. The resemblances are so close that it is disputed whether structures found in otherwise normal ovaries should be regarded as accessory suprarenals or as hypertrophied corpora lutea. This point is well illustrated by a specimen described by Pillet as a hypertrophied corpus luteum and afterwards considered by others to be a suprarenal adenoma of the ovary. The difficulty is accentuated when we are dealing with a tumour, and in comparatively few instances can its origin be definitely determined. It is certain that lutein cells may proliferate to form lutein cysts and it is probable that occasionally they give rise to malignant tumours.

(c) *Origin from the Interstitial Cells of the Ovary.*—It has been suggested that tumours composed of lutein-like tissue may arise from the interstitial cells scattered through the ovarian stroma. The possibility of such an origin cannot be denied but it has not yet been demonstrated.

HISTOGENESIS OF OVARIAN TUMOURS

From what cell-groups do the epithelial tumours of the ovary arise? This question is one to which a definite answer cannot be given. When the cells of the

tumour reproduce the histological characters of a tissue already existing in the ovary we can form a definite opinion upon the origin of the tumour, as for example in lutein cysts, in chorionepithelioma, and in the development of squamous-celled carcinoma in a cystic teratoma. But the origin of most epithelial new growths of the ovary is obscure because their cells do not correspond to any pre-existing type, and because glandular structures comparable to those found in the uterus or intestinal tract are absent from the ovary.

In the normal ovary, epithelium is found (i.) as a lining to the Gräafian follicles, (ii.) in association with Wolffian remains, (iii.) as the general surface-epithelium. Each of these epithelia may form the starting-point of tumour-formations.

(i.) *Origin from the Gräafian Follicles.*—The theory of origin of epithelial tumours by proliferation of the Gräafian follicles was first propounded by Accorci in 1890, and for a time his views were widely adopted. He based his theory upon the existence of certain histological structures which resembled closely in appearance the developing or fully developed follicles; these structures appeared to be in many instances the starting-point of a proliferating new growth, they were regarded as true follicles, and were believed to be the nidus from which the epithelial tumours developed. The follicle-like bodies are seen scattered throughout the epithelial masses of the tumour or more or less isolated amongst the connective-tissue cells. They possess a central cavity of variable size lined by cubical or polyhedral cells, and within the cavity lies a protoplasmic disc which is stained red by van Gieson's stain. The disc may contain a large nucleus possessing several nucleoli, or the nucleus may be absent; the epithelium surrounding the disc is often cubical and comparable in every way to that of the primordial follicle or may be flattened and spindle-shaped: occasionally it is represented only by a band of nucleated protoplasm without cell outlines. When such follicular structures exist in a tumour they increase by proliferation of their epithelial lining; in malignant tumours epithelial tubes invade the stroma; whilst in both malignant and innocent growths the epithelial cells grow towards the follicle cavity, penetrate the central disc, and divide it into two or more protoplasmic masses. By repetition of the process several follicle-like bodies may be found within a single alveolus, and to this type of tumour von Kahlden has given the name 'adenoma of the Gräafian follicle.'

If it can be clearly demonstrated that these structures are true follicles the tumours which contain them may reasonably be regarded as folliculomata, but up to the present such demonstration is lacking, and the theory has been subjected to the following criticisms. In the first place, the ova and Gräafian follicles are formed only in embryonic life and under normal conditions the primordial follicles never

multiply by division in post-natal life; it is therefore improbable that such division occurs under pathological conditions. Secondly, the changes which are known to take place in the formation of a Gräafian follicle from the epithelium of a Pflüger's tubule are never seen in the production of the folliculomata. The recent work of Voigt, M'Iroy, and others renders it probable that the supposed follicles are merely degenerate areas of growth in which the protoplasm undergoes a hyaline or mucinoid change, the nucleus divides and the cell thus formed increases in size, becomes



FIG. 440.

The surface of the ovary is destitute of epithelium. In the cortex is a tubular space lined by a single layer of columnar epithelium.

vesicular, and assumes a form resembling that of an ovum. Simultaneously neighbouring cells group themselves around so that the whole mass resembles a primordial follicle. Lipman has described similar appearances in a mucous polypus of the uterus.

(ii.) *Origin from Wolffian Remains.*—The origin of certain ovarian tumours from Wolffian remains in the hilum of the ovary has been held by numerous authors. Olshausen in 1877 was the first to ascribe such an origin to papillomatous tumours, and since that time Doran and others have supported this view. Piper indeed

states that he has been able histologically to follow the development of Wolffian tubule into cystic cavities in which later papillomata appeared.

Between 1880 and 1890 Alban Doran in a series of papers endeavoured to prove that papillomatous cysts arise in connection with Wolffian remains. This theory of the origin of papillomatous cysts is based partly upon histological and partly upon anatomical considerations. The epithelial cells of the cysts resemble those of the parovarium. The cells are columnar and ciliated in both cases. Doran



FIG. 441.

The section resembles that seen in Fig. 440. In this specimen several tubular spaces are seen grouped in a manner similar to that of the acini of a gland.

points out that papillomatous cysts often burrow between the layers of the broad ligament and involve the hilum alone, the oöphoron remaining distinct. That some papillomatous cysts develop in the hilum of the ovary is probable, but the work of Whitridge Williams has clearly demonstrated that they also rise quite independently of Wolffian structures, while Massabuau and Etienne have found Wolffian tubules in the hilum but were unable to establish any continuity between these dilated tubules and the new growth.

(iii.) *Origin from Surface-Epithelium of the Ovary.*—Waldeyer in 1870, in his book *Eierstock und Ei*, concluded that most ovarian tumours arose from a pro-

liferation of the surface-epithelium of the ovary. He taught that the epithelium proliferated and penetrated into the ovarian stroma, forming structures similar to Pflüger's tubules, and that from these tubules innocent and cancerous growths arose. This view has been supported by Malassez and Sinéty, who describe the surface-epithelium as proliferating in the forms of rods or tubules which eventually developed into adenomata or carcinomata.

Marchand showed that epithelium from the Fallopian tube might extend to

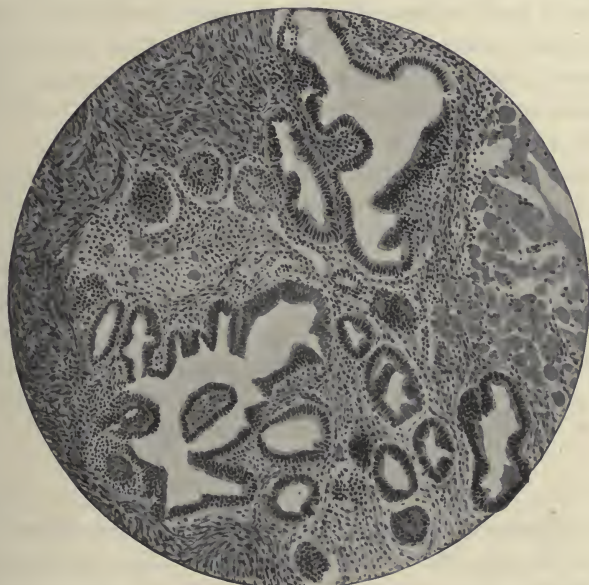


FIG. 442.

The glandular form is more clearly marked and processes covered by columnar epithelium are seen projecting into the lumina. To the right of the section are lutein cells.

the surface of the ovary, and believed that from such an extension, down-growths took place from which cystomata might develop.

Ovarian cysts have usually attained a large size before they are removed by operation, and are therefore unsuited for the study of the early stages of development; the best materials for this purpose are ovaries normal as far as their naked-eye characters are concerned, and cut in serial section. A series of eighty such observations has been reported by Walthard, and his paper is a valuable addition to our knowledge upon this abstruse subject. He finds very frequently in the stroma of the ovary collections of epithelial cells derived from but seldom in connection

with the surface-epithelium. In these isolated masses the cells may have very diverse forms, and are capable of proliferation and cyst-formation. Sometimes the masses consisted of round or oval cells, with clear vesicular nuclei; sometimes the cells were arranged around a small cavity, and from them processes lined by a single layer of columnar epithelium grew out into the stroma; sometimes they formed tubular structures lined by ciliated epithelium, some of which contained branching papillae. Walthard's work constitutes one more link in the chain of evidence which is being gradually forged and which when completed will probably prove that ovarian cystomata most frequently arise neither from Wolffian remains nor from Gräafian follicles, but from masses of epithelium, derived from the germinal layer, which may grow and develop into cysts even after they have lain for many years quiescent in the ovarian stroma.

Figures 440, 441, and 442 illustrate early stages in the development of cystic adenomata. The ovaries from which these sections were prepared presented nothing abnormal in their naked-eye characters. In each case a large multilocular cystic tumour of the opposite ovary was removed by operation.

It is probable that carcinoma of the ovary arises from masses of adenomatous tissue: the precancerous or adenomatous stage has been well described by M'Ilroy. The question most difficult to decide is "What is the origin of these adenomata?" their origin from a Gräafian follicle is doubtful; it is probable they arise from down-growths of the surface-epithelium or from included cell-rests.

The Growth of Ovarian Cysts

The rate of growth of ovarian tumours varies greatly and depends mainly upon the histological characters of the particular tumour. Follicular cysts, cystic teratomata, and fibromata usually grow slowly, whereas the cyst-adenomata and malignant tumours often grow with great rapidity. When small, ovarian tumours are usually round or oval in shape; unilocular cystic tumours and innocent solid growths maintain this shape throughout, but if a cyst be multilocular or if it contain intracystic growth one part may develop more rapidly than another and the tumour become irregular or bossed. Such irregular proliferations are also frequently seen in malignant growths which may become fissured, and lobulated. In its earlier stages, whilst still small, the tumour occupies the normal situation of the ovary but when it increases in size its position depends to a great extent upon the length of the pedicle. If the tumour be pedunculated and grow outwards it becomes prolapsed and occupies the retro-uterine pouch of peritoneum or, more rarely, lies in front of the uterus. As it becomes still larger it rises out of the pelvis, assumes a more

central position, displaces the intestines upwards and backwards and comes into contact with the anterior abdominal wall, often at the same time displacing the uterus downwards and backwards.

With very large tumours the diaphragm is displaced upwards and the lower part of the thoracic walls everted and expanded. A large pedunculated tumour lies completely above and rests upon the brim of the pelvis, except in those cases where part of the tumour is impacted. Impaction in the pelvis may result from the formation of adhesions or from irregular growth of the component parts of a cyst; the tumour lies in the retro-uterine pouch below the promontory of the sacrum, the uterus is pushed forwards and lies close behind the symphysis pubis.

Ovarian tumours are not always pedunculated, they may burrow beneath the peritoneum and grow wholly, or in part, outside the peritoneal cavity. If the tumour grow towards the broad ligament it gradually separates the two layers and becomes an intraligamentous tumour. Such a tumour may strip up the peritoneum from the posterior pelvic wall and burrow to the right beneath the caecum or to the left beneath the sigmoid flexure; much more rarely it strips the peritoneum from the anterior wall and reaches the neighbourhood of the bladder.

Intraligamentous tumours displace the uterus to one side, and often burrow down in the cellular tissue beside the cervix to present in the vaginal vault.

THE CLINICAL FEATURES OF OVARIAN TUMOURS

Symptoms.—In most cases the symptoms of an ovarian tumour in its earlier stages are few and slight; the patient often seeks advice solely on account of a gradual and painless increase in size of the abdomen. When grave symptoms arise they are usually due to pressure exerted by the tumour on surrounding structures or to an accident, such as torsion of the pedicle, inflammation, or rupture.

Menstruation.—In the majority of cases menstruation is not affected. Griffith in 1895 analysed 118 consecutive cases operated on in Martha Ward of St. Bartholomew's Hospital: in 20 cases the patient had not reached puberty or had passed the menopause. Of the remaining 98, in 73 menstruation was normal, in 7 there was amenorrhoea, in 7 menorrhagia, and in 8 menstruation was irregular in regard to both time and quantity; of the remaining 3 no note was made. Amenorrhoea is commonest in cases of bilateral solid growths. Metrorrhagia occurs in only a small proportion of the cases; in women past the menopause, uterine haemorrhages, sometimes profuse, are met with occasionally. Dysmenorrhoea is an uncommon symptom.

Sterility is common but it is by no means a rare event for the subjects of ovarian tumours to become pregnant. So long as ova ripen in either ovary, pregnancy is possible.

Pain is most often caused by pressure of the tumour. It may result from inflammation, from torsion of the pedicle, or from rupture. In some cases pain is felt in one or other iliac fossa a few days before the period or midway between the periods; such periodic pain is possibly associated with the process of ovulation. A comparatively small cyst impacted in the pelvis may by pressure on the cords of the sacral plexus cause severe pain referred to the backs of the thighs. If the tumour grow rapidly and lead to great distension pain may be caused by stretching of the abdominal walls.

Mammary Symptoms.—Ovarian tumours are occasionally accompanied by signs of activity in the breasts. Enlargement and tenderness, pigmentation of the areola, and secretion are sometimes present.

Ascites is common in the case of malignant growths, solid tumours, and papillomatous cysts. It is rare with the cyst-adenomata, except after rupture.

Oedema of the legs, abdominal walls, and vulva may result from pressure by large innocent tumours, but marked oedema, especially if unilateral, is always suggestive of malignancy.

Respiratory Symptoms.—Large tumours diminish the capacity of the thorax by displacing the diaphragm upwards. Dyspnoea on exertion and, in severe cases, orthopnoea result:

Cardiac Symptoms.—The heart may be displaced upwards and the displacement may be associated with palpitation. Degeneration of cardiac muscle is not infrequent with large cysts and may lead to attacks of syncope.

Digestive Symptoms.—Dyspepsia is common, resulting doubtless from pressure upon and interference with the functions of the stomach and intestine. Vomiting occurs in some cases probably from the same cause.

Urinary Symptoms.—Vesical irritability is an occasional early symptom. Retention of urine is rarer than with uterine fibromyomata for most ovarian tumours are pedunculated and rise above the brim of the pelvis as they enlarge; but if for any reason a tumour is impacted, the uterus is displaced forwards and compresses the urethra and neck of the bladder against the symphysis pubis. The ureters may be compressed by the growth, particularly in the case of intraligamentous cysts; they then become dilated, the pelves of the kidney are distended and hydronephrosis results. Death may occur from suppression of urine. Should the bladder become infected, the infection may spread to the kidney, pyonephrosis develop, and uraemia

supervene. In some cases albumen is found in the urine probably as the result of pressure upon the renal veins; such pressure may also be responsible for the interstitial changes frequently found in the kidneys of patients who have suffered from large ovarian cysts.

Rectal Symptoms.—A cyst situate in the pelvis may from pressure on the rectum cause obstinate constipation or painful defaecation. An inflamed or suppurating cyst may give rise to rectal irritation and mucous diarrhoea.

Varicosities.—Haemorrhoids, varicose veins of the legs, varicosities of the vulva, and enlargement of the superficial veins of the abdomen may result from pressure upon the inferior vena cava or other intra-abdominal veins.

Abdominal Herniae.—Umbilical or ventral hernia, and prolapsus uteri may be produced by the increase of intra-abdominal pressure.

General Symptoms.—With a large ovarian tumour the patient's general health suffers. From digestive disturbances she may lose flesh and become anaemic; in some cases there is extreme emaciation. Nervousness, mental depression, and sleeplessness are present occasionally, and may produce the anxious drawn expression which constitutes the "facies ovarica."

Symptoms of Malignant Ovarian Tumours.—The symptoms usually begin with pain, among both the younger and the older patients. The pain is sometimes of gradual onset, at others sudden and acute; it may be referred to the lower abdomen, or may be pelvic.

Enlargement of the abdomen not unfrequently first attracts the notice of the patient. The enlargement is gradual, but a sudden increase often marks the onset of ascites.

Some irregularity of menstruation is common when the growth occurs during the period of sexual life; the menses may be regular in time but excessive in amount, or irregular in both time and amount. Irregular uterine haemorrhages are not infrequent in women who have passed the climacteric. In the later stages, when anaemia and cachexia are present, amenorrhoea is the rule.

Among the rarer modes of onset may be mentioned rapid wasting without apparent cause, vomiting, gastro-intestinal disturbances, polyuria, and retention of urine.

PHYSICAL SIGNS AND DIAGNOSIS OF OVARIAN TUMOURS

Ovarian tumours differ so markedly in the size they attain and the position they occupy that it is advisable to divide them for purposes of diagnosis into two classes:

1. Small tumours situated in the pelvic cavity.
2. Large tumours situated in the abdominal cavity.

1. Small Tumours which have not risen above the Pelvic Brim

Position of the Tumour.—Small ovarian tumours at first occupy the normal situation of the ovary and are found behind the broad ligament in one or other posterior quarter of the pelvis. When they attain a size two or three times that of the normal ovary they sink to a lower level and occupy the retro-uterine pouch, displacing the uterus forwards. In this position they remain until becoming too large to be accommodated in the pelvis they rise above the brim and occupy the abdominal cavity. If the tumour be intraligamentary it lies to one side of the uterus, pushing it over towards the opposite wall of the pelvis; occasionally, when provided with a long pedicle, the tumour lies in front of the uterus displacing it backwards.

Physical Characters of the Tumours.—A small ovarian tumour is globular or oval in shape. The cystic tumours are smooth and elastic, but the walls are tense from the presence of the contained fluid and fluctuation can seldom be obtained. The cystic teratomata are inelastic and doughy. Solid tumours are rarer than cystic; their surface is often lobulated and irregular, particularly in the case of malignant growths. With the exception of intraligamentary cysts, ovarian tumours are connected to the uterus by a pedicle, and the recognition, when possible, of this pedicle is an important aid in diagnosis. It is often difficult to feel, but if the tumour be pushed up above the brim of the pelvis a cord-like structure connecting it with the uterine cornu may be palpated.

The first step in the diagnosis is to ascertain whether the tumour is distinct from, or part of, the uterus. With pedunculated tumours this is not difficult, for on bi-manual examination the uterus can be felt as a body separate and distinct from the tumour, and movements imparted to it are not communicated to the tumour. When the tumour is adherent to the uterus, however, tumour and uterus move as one mass. With broad-ligament cysts we find on bi-manual examination a constriction separating the uterus from the tumour; this constriction is most clearly marked by the side of the cervix and can be best appreciated through the vaginal vault.

Differential Diagnosis.—*Inflammatory Enlargement of the Ovary.*—An inflammatory swelling of the ovary is seldom larger than a pigeon's egg. In acute oöphoritis the symptoms of septic intoxication, raised temperature, furred tongue, and malaise are present in addition to those of a localized peritonitis, whilst the ovary itself is exquisitely tender to the touch. In chronic cases we find fixation from adhesions and pelvic tenderness. A small inflamed cyst fixed by adhesions to the uterus or other neighbouring viscera may give precisely similar physical signs.

Hydrosalpinx may simulate an ovarian cyst, particularly when the distended

tube is displaced and occupies the retro-uterine pouch. Generally speaking, a hydrosalpinx is situated lateral to the uterus, in shape it is elongated and from its dilated distal extremity a tortuous tube passes inwards, narrowing as it approaches the uterus. It is less movable than a pedunculated ovarian tumour and is often associated with pelvic inflammation.

Tubal Gestation.—In undisturbed tubal pregnancy the ovum may form a small movable tumour by the side of or behind the uterus. In such a tumour pulsation can usually be detected, and this fact, together with the presence of the signs and symptoms of pregnancy, must be mainly relied upon in establishing the diagnosis. In tubal moles and haematosalpinx no pulsation is felt as a rule, but in these conditions a history of acute pain and of haemorrhage from the uterus is usually to be obtained.

Pregnancy.—In the earlier weeks of pregnancy the body of the uterus forms a globular swelling whilst the lower uterine segment is so softened that the connection between the cervix and body cannot always be easily determined. The body of the uterus under these circumstances may be mistaken for an ovarian cyst. A history of amenorrhoea and vomiting, together with signs of activity in the breasts and softening of the cervix, usually makes the diagnosis clear, but in difficult cases a second examination a few weeks later will place it beyond all doubt.

A retroflexed gravid uterus forms an elastic swelling behind the cervix; if it be felt to contract and harden its identity with the uterus is established. Failing this, the presence of the signs and symptoms of pregnancy, and the absence of the body of the uterus from its normal situation serve to distinguish the retroflexed uterus from an ovarian cyst. The position of the cervix is also important: with a retroflexed gravid uterus it lies close behind the pubes but high up, whilst with an ovarian cyst displacing the uterus forwards the cervix is usually pushed down.

Uterine Fibromyomata.—Subperitoneal fibromyomata, particularly if pedunculated, simulate closely ovarian tumours. The rate of growth, when this is known, and the clinical history must all be taken into account in diagnosis. Fibromyomata, even when pedunculated, are more closely attached to the uterus and move with it to a greater extent than ovarian tumours. But it must be remembered that intraligamentary cysts are often directly attached to the side of the uterus and may even burrow in amongst its muscle-fibres. Unless a definite sense of fluctuation can be obtained it is almost impossible to diagnose such a cyst from a fibroid. Further help may be obtained from the situation of the round ligaments; if these can be felt to terminate on the tumour there can be no doubt of its uterine origin. Examination with the sound is of limited value; subperitoneal fibroids do not necessarily

cause elongation of the cavity and, on the other hand, elongation of the cavity is found in cases of intraligamentous cysts when the uterus is stretched over the surface of the tumour. If on bi-manual examination we detect two normal ovaries the presence of an ovarian tumour can be positively excluded.

Exudates in the retro-uterine pouch of peritoneum, whether blood, serum, or pus, may be mistaken for an ovarian cyst. Such collections are fixed and often irregular in outline, whereas an ovarian tumour is movable and regular. A history pointing to pelvic inflammation, or the rupture of an ectopic gestation sac, is in favour of the diagnosis of an exudate.

2. Large Ovarian Cysts occupying the Abdominal Cavity

The first stage in the diagnosis of a large ovarian cyst is to recognize the existence of a definite tumour. The physical characters of the tumour will depend upon the size and variety of the cyst. Medium-sized cysts usually form smooth rounded tumours situated mainly in the middle line of the lower abdomen. The surface of the tumour is smooth when the cyst is unilocular or is composed of loculi which do not project above the general level of the cyst-wall, and when no intracystic growths are present. When individual loculi project or when the cyst contains masses of solid growth the surface may be irregular and bossed. The consistence varies; cysts containing but little solid material, few loculi, and contents of low specific gravity are elastic, and fluctuation can be readily obtained over them. If these conditions be not present the tumour feels more solid and the fluid thrill is absent. The larger tumours occupy the greater part of the abdominal cavity, they evert the ribs, compressing the viscera and often interfering with the movements of the diaphragm. Since, as already stated, the first step in diagnosis is the recognition of a definite tumour, it will be convenient first to discuss conditions which may simulate abdominal tumours.

Differential Diagnosis.—Obesity.—The diagnosis between obesity and an ovarian cyst is not always easy. We must take into consideration first the general appearance of the patient; obesity is not limited to the abdomen, it affects all parts of the body. A patient with an ovarian cyst may be emaciated, but emaciation is a symptom of the later not of the earlier stages. With obesity, the abdominal walls are thick and the umbilicus is depressed at the bottom of a deep pit; with an ovarian cyst, the abdominal walls are often stretched and thinned, whilst the umbilicus is flush with the surface or even protrudes on account of the increased intra-abdominal pressure. With an ovarian cyst we can outline with the hands a definite tumour with distinct boundaries and the percussion note over this tumour is dull. In cases of obesity we cannot outline a definite tumour, and on deep percussion we can elicit a resonant

note over the whole abdomen. Such are the main points of distinction between the two conditions, but it must be remembered that the two may co-exist in the same patient.

Flatulent Distension of the Bowels.—In this condition the abdomen is distended, the walls are stretched and the umbilicus prominent, but no definite tumour can be discovered on palpation, and the abdomen is everywhere resonant.

Ascites.—*Inspection.*—The fluid of an ovarian cyst is limited by the cyst-wall and forms a definite projection, distending the lower abdomen towards the middle line; the lumbar regions are expanded to only a slight extent by the displaced bowels. In ascites the central part of the abdomen is flattened, and when the patient lies on her back the lumbar regions bulge outwards from gravitation of the free fluid into the flanks. In both conditions the umbilicus protrudes.

Palpation.—In ascites we can outline no definite tumour and can obtain a fluid thrill over all parts of the abdomen; with an ovarian cyst we can outline a tumour and, unless the cyst be unilocular, cannot obtain a thrill over every part. On bi-manual examination we may feel two normal-sized ovaries.

Percussion.—As an ovarian cyst increases in size it approaches the anterior abdominal wall and displaces the intestines into the flanks, consequently the central parts of the abdomen are dull to percussion and the flanks resonant. Free fluid gravitates to the flanks and the intestines float up towards the abdominal wall, the central part of the abdomen is therefore resonant and the flanks are dull. An ovarian cyst is capable of only limited changes in position and in whatever posture a patient lies, whether on her back or on her side, the area of dulness remains almost constant. In ascites the fluid can move freely, and if the patient be placed upon one side the fluid gravitates downwards, the intestines float up, and the opposite flank becomes resonant. This phenomenon of displaceable dulness is characteristic of free fluid. It must be remembered that an ovarian cyst may grow towards one flank or may become fixed there by adhesions; in such a case the flank will be dull to percussion.

Mensuration.—Measurements taken with the tape may assist in diagnosis. In ascites the greatest girth is usually at the umbilicus, with an ovarian cyst it is often below this level. In ascites the distance from the umbilicus to the ensiform cartilage is usually greater than the distance from the umbilicus to the pubes; with an ovarian cyst the lower part of the abdominal wall is stretched more than the upper, and the latter measurement becomes as great as or greater than the former. Finally an ovarian cyst often distends the abdomen more on one side than the other, and consequently the distance from the umbilicus to the anterior superior spine of the ilium

is increased on the side of greater distension. With ascites the measurement is usually equal on the two sides.

An ovarian tumour may be complicated by free fluid in the abdominal cavity either from rupture of the cyst-wall and the escape of its contents or from the presence of ascitic fluid associated with papillomatous cysts, malignant growths, and some forms of solid tumour.

Encysted Collections of Fluid.—Encysted collections of inflammatory fluid are difficult to diagnose from ovarian cysts. Such collections are found in tuberculous and other forms of chronic peritonitis and in association with localized peritonitis due to disease of the uterus or its appendages. Such 'perimetric cystomata' occupy the retro-uterine pouch displacing the uterus forwards, or are situated above the pubes. In either case they may simulate an ovarian cyst. The points upon which we lay most stress in diagnosis are the following: An ovarian cyst forms a definite rounded projection beneath the abdominal wall; over an encysted collection of inflammatory fluid there is usually no marked projection. An ovarian cyst possesses well-defined boundaries and is of a rounded regular form; an encysted collection of fluid has no boundary which can be clearly defined, it shades off gradually into the surrounding thickened and inflamed tissues and is of an irregular shape. With many ovarian cysts a pedicle can be distinguished; an encysted collection of fluid has no pedicle. Encysted inflammatory fluid has no sac-wall of its own, its boundaries are formed in part by coils of intestine adherent to one another and in part by the anterior abdominal wall, the adherent bowel alters the percussion note, so that instead of the dull note of an ovarian tumour we have one of modified tympany.

Exudates in the subperitoneal tissues due to puerperal parametritis may simulate an ovarian cyst. Such exudates form a definite tumour in one or other broad ligament, displacing the uterus to the opposite side of the pelvis. The tumour seldom possesses clear and definite boundaries, but fades off gradually into the infiltrated surrounding tissue. The exudate tracks forwards beneath the peritoneum in the iliac fossa, and a hard swelling is felt in the anterior abdominal wall above Poupart's ligament. The swelling has a sharp margin ending abruptly above at its superior border, and below is lost in the general induration of the pelvic cellular tissue. These physical characters, together with a history of an onset shortly after labour, a febrile puerperium, and the general symptoms of a septic intoxication, serve to distinguish a parametric effusion from an ovarian cyst.

A distended bladder forms a tumour resembling in many respects an ovarian cyst. It rises from the pelvis, is centrally situated, smooth, and elastic. The

fact that incontinence of urine occurs with over-distension of the bladder has led to many errors of diagnosis, and too great stress cannot be laid upon the necessity of passing a catheter in all cases of abdominal tumour complicated by retention or incontinence of urine or by frequency of micturition. The diagnosis can be made certain by the passage of a catheter, but it must be passed sufficiently far to overcome any obstruction at the brim of the pelvis. If the tumour be a distended bladder a large quantity of urine will be withdrawn and the tumour disappear. Such a tumour is less movable than an ovarian cyst, it never possesses a pedicle, and it invariably lies in front of the uterus.

Tumours of the Uterus.—Three tumours of the uterus may give rise to difficulties of diagnosis—the pregnant uterus; uterine fibroids; a haematometra. If the tumour be uterine, on bi-manual examination movements imparted to the tumour are transmitted to the cervix, and *vice versa*; an ovarian tumour moves with the uterus only when adherent to it.

(a) *Pregnancy.*—When a reliable history can be obtained it possesses a definite value. If in a woman previously regular the periods suddenly cease the fact in itself is strongly in favour of pregnancy. It is not, however, in such cases that difficulty usually arises, but when a woman conceives during a period of amenorrhoea due to lactation or some other cause, or when the pregnancy is complicated by haemorrhages which the patient regards as menstrual; diagnosis then must rest entirely upon physical signs. All cases must be approached with an open mind and too much weight must not be attached to the opinion of the patient herself. It is during the fourth and fifth months of pregnancy that difficulty is most often experienced, for at this time if the uterus be in a position of marked ante flexion it is sometimes impossible to trace continuity between the tumour and the vaginal portion of the cervix. In doubtful cases we commence by examining the breasts for signs of activity, but in a woman who has borne children these are often but little marked. The examination of the abdomen furnishes the most reliable signs; the pregnant uterus is a tumour with muscular walls and can be made to contract and harden under the hand; if such contractions be obtained it is clear that we are dealing with a muscular sac. The foetus can often be mapped out, foetal movements felt, and a uterine bruit and sometimes the foetal heart heard. These characters distinguish the pregnant uterus from an ovarian cyst. On vaginal examination in pregnancy we find blue coloration of the mucosa and softening of the cervix; neither of these signs is present with an ovarian cyst. With hydramnios and hydatidiform mole the difficulties are increased, for here we have a cystic tumour and the foetal signs are often unavailable. The sac is, however, contractile, a uterine bruit can be heard,

and the round ligaments can sometimes be traced into the tumour. Help may be obtained by drawing down the cervix by a volsellum and examining with the finger in the rectum; the cervix can then be traced on to the tumour, the insertions of the utero-sacral ligaments can be felt, and the body of the uterus cannot be demonstrated.

(b) *Uterine Fibroids*.—Fibroids are usually solid tumours, they are attached to the uterus, the uterine cavity is often elongated, they grow slowly and cause menorrhagia. The majority of ovarian tumours are cystic, they can be differentiated from the uterus, the uterine cavity is not elongated, they grow rapidly, and menstruation is unaffected. In most cases these characteristics are sufficient to distinguish the two groups from one another, but when the fibroid is cystic or has undergone marked softening great difficulty may be experienced. On abdominal examination two points of importance are to be noted: (1) The situation of the round ligaments. In cases of uterine fibroids these are often enlarged, may be felt through the abdominal wall in a thin patient, and can be traced on to the surface of the tumour. (2) The presence of a bruit over the tumour. A softened fibroid is often vascular, and a bruit resembling the uterine bruit of pregnancy is sometimes heard over its surface; a bruit is never heard over an ovarian cyst. The uterine sound, if it can be passed for a distance of three or four inches into the centre of the tumour, will give conclusive evidence of its uterine origin. With subperitoneal fibroids the length of the uterine cavity is not necessarily increased, and a submucous fibroid projecting into the cavity may obstruct or deflect the canal, so that if the sound passes for its normal distance only, this must not be taken to exclude the diagnosis of a fibroid tumour. The bladder sound has a limited use in diagnosis. With fibroids the bladder is sometimes drawn up and elongated; with ovarian tumours as a rule there is no displacement, but it must be remembered that it is not uncommon for the bladder sound to pass only the normal distance in cases of fibroids.

(c) *Haematometra*.—A uterus distended with blood may be mistaken for an ovarian cyst. Such a tumour can usually be identified as the uterus by the methods already described. Cervix and tumour move as one mass, the uterus cannot be identified apart from the tumour, the round ligaments may be traced on to the surface of the tumour, and the uterine sound passes for a distance greater than the normal into the tumour.

Renal Tumours.—It is possible to mistake a movable kidney for a small ovarian tumour if its mobility be sufficiently great to allow it to descend to, and lie over, the brim of the pelvis. On the other hand, an ovarian tumour may be mistaken for a renal tumour if it possess a long pedicle and become fixed by adhesions in the lumbar

region, or if, as it rises with the uterus during pregnancy, it comes to occupy a position in the lumbar region.

A hydronephrotic kidney may simulate an ovarian cyst, and in the case of large tumours the diagnosis may be difficult. The chief points of distinction are as follows : A renal tumour occupies a more lateral position and as a rule is confined to one half of the abdominal cavity. No direct connection can be traced between it and the uterus. Both ovaries may be palpated and felt to be separate and distinct from the tumour. On percussion there is a band of resonance over the anterior surface due to the presence of the ascending or descending colon. Help may be obtained by cystoscopic examination and catheterization of the ureters ; if we find no urine escapes from the ureter of the side on which the tumour is situated the suspicion of hydronephrosis will be confirmed.

Pancreatic Cysts.—Cysts of the pancreas form fluctuating tumours beneath the left costal arch, and as they enlarge grow downwards. The stomach and liver are displaced upwards, the transverse colon downwards, and the anterior layer of the great omentum is stretched in front of the tumour. Such growths seldom extend to the pelvis. Both ovaries can be palpated on bi-manual examination and no pedicle attaching the tumour to the uterus can be felt.

Tumours of the Spleen.—A spleen, when enlarged from malaria, from new growth, from spleno-medullary leukaemia, or from other causes, may simulate an ovarian tumour when occupying the pelvic cavity or resting on the pelvic brim. If not too large the spleen can usually be replaced into the left hypochondriac region, the notches in the anterior border can be felt, and both ovaries can be palpated. In case of doubt the blood should be examined for malarial parasites and a differential count of the white blood-corpuscles be made.

Mesenteric and retroperitoneal tumours may give rise to difficulty in diagnosis when of large size or situated in the lower part of the abdominal cavity. Here again we fail to trace any connection between the tumour and the uterus, and may be able to identify both ovaries. A point of some importance is the relation of the intestines to the surface of the tumour ; retroperitoneal and omental tumours often push coils of bowel in front of them, and an area of resonance may be found there ; ovarian tumours are usually in contact with the abdominal wall, and resonance is obtained only above and in the flanks.

Echinococcus Cysts.—Hydatid cysts of the liver, the omentum, or other abdominal viscera may simulate ovarian tumours. The diagnosis in these cases rests mainly upon the possibility of establishing a connection between the liver and the tumour, or, in the case of omental hydatids, upon the presence of multiple tumours. No

definite pedicle connecting the tumour with the uterus can be found, and on bi-manual examination it may be possible to feel two ovaries separate and distinct from the tumour. Symptoms afford very little help; in both cases a painless enlargement of the abdomen is the striking feature.

Diagnosis of the Variety of Tumour

It is not sufficient to rest content with a diagnosis of ovarian cyst, we must endeavour to go a step further and to ascertain to what particular variety the cyst belongs. An opinion on this point can be formed only after considering the physical characters of the tumour and the symptoms to which it gives rise; these have already been described in the sections dealing with classification and morbid anatomy.

Diagnosis of Intraligamentary Tumour.—As a rule the mobility of intraligamentary tumours is very limited, but if a growth be situated some distance from the uterus and separate the two layers of the broad ligament at their outer extremity only, it may possess a distinct pedicle capable of undergoing torsion. Fixity of a tumour, however, is one of the signs of an intraligamentary site. A small ovarian cyst may be fixed in the pelvis by adhesions or by incarceration, and a pedunculated tumour so fixed will simulate an intraligamentary cyst. A second point, and one of equal importance, is the relation of the tumour of the uterus. Intraligamentary tumours displace the uterus to one side, adherent or impacted cysts push the uterus forwards towards the back of the pubes; both intraligamentary and impacted cysts may displace the uterus forwards and to one side, but the characteristic displacement caused by the former is forward, and by the latter to one side. The cyst may be attached closely to the uterus and even burrow in between the muscle-fibres; in such cases uterus and cyst form one tumour, but often a groove can be felt between them. Intraligamentary cysts usually grow backwards and strip up the peritoneum from the posterior pelvic wall, but some, particularly papillomatous tumours, extend forwards and occupy the vesico-uterine pouch. The uterus may be stretched over the surface of the cyst and its cavity be elongated to a length of four or five inches. Such stretching is rare with extraligamentary growths. Broad-ligament cysts sometimes burrow deeply in the parametric tissue at the base of the ligament and may be felt close beneath the vaginal fornix; in such cases the ureter is often intimately united with the cyst-wall and is in grave danger of injury during removal of the cyst.

Diagnosis of Malignancy.—The diagnosis of malignancy in an ovarian tumour rests partly upon the symptoms it causes, and partly upon the physical characters of the growth.

(1) *Age.*—The age of the patient is a factor of some importance but great stress

must not be laid upon it. It is true that ovarian carcinomata are commoner in elderly women, but sarcomata and malignant teratomata are found in young patients.

(2) *Wasting and Cachexia*.—Large innocent tumours lead to rapid loss of flesh and to cachexia, but if these symptoms are found with a small or medium-sized growth they are suggestive of malignancy.

(3) *Ascites*.—Small quantities of free fluid are found in the peritoneal cavity with solid innocent tumours and with some varieties of cyst; ascites is also a common concomitant of papillomatous tumours. In spite of these facts the presence of a large ascites is suggestive of malignancy.

(4) *Oedema*.—Oedema of the legs, labia, and lower abdominal wall may be caused by the pressure of a large innocent tumour. When these symptoms are present with a small tumour, or when the oedema is unilateral, the growth is probably malignant.

(5) *The Presence of other Growths in any Part of the Body*.—Ovarian carcinomata are often secondary tumours, and the primary growth may be in the intestine, breast, or uterus. Malignant ovarian tumours may themselves give rise to secondary growths in the liver, lungs, or other viscera. The presence of such growths suggests that the tumour is malignant.

(6) *Physical Characters of the Tumour*.—The surface of a malignant tumour is often covered by small irregular nodules felt easily through the vaginal fornices or *per rectum*. The presence of such nodules, especially when the vaginal and rectal walls cannot be moved freely over them, suggests malignancy.

(7) *Bilateral tumours* of small size, particularly if one or both be intraligamentary, are often malignant.

(8) *Dissemination in the Peritoneum*.—With malignant growths small secondary nodules are often found on the surface of the peritoneum; by combined rectal and vaginal touch the opposed peritoneal surfaces of Douglas's pouch can be rubbed together and felt to be irregular and roughened from the presence of small masses of growth.

(9) *Fixation of the Growth*.—In their early stages malignant tumours are movable, later they become fixed from invasion of surrounding structures by the growth. We find then hard induration fixing the tumour and rendering it immobile. Fixation is one of the later signs of malignancy and indicates that the growth is no longer confined to the ovary.

(10) *Abderhalden's Test*.—It has been established that the blood of a pregnant woman contains a ferment specific to placental protein, and the demonstration of the presence of this ferment is evidence of pregnancy. On the same principle if a

patient be the subject of carcinoma of the ovary a ferment specific to ovarian carcinoma-protein may be present in her blood, and the demonstration of this ferment may be employed as an additional means of diagnosis. The technique of the test is identical with that used for the diagnosis of pregnancy except that a portion of ovarian carcinoma is substituted for placenta.

COMPLICATIONS OF OVARIAN TUMOURS

Torsion of the Pedicle

The great majority of ovarian tumours are pedunculated structures. The pedicle is composed of the Fallopian tube, the mesosalpinx, the two layers of the broad ligament, the ovarian ligament, and the ovarico-pelvic fold within which run the main ovarian vessels. Cysts of small size do not cause displacement of the Fallopian tube and the mesosalpinx, but larger tumours, as they grow, obliterate the mesovarium and elongate the Fallopian tube, the ovarian ligament, and the ovarico-pelvic fold; usually the pedicle does not exceed 2 to 3 inches in length, but longer pedicles are met with occasionally, and in such cases the tumours are extremely mobile and can be pushed into almost any part of the abdominal cavity. The pedicle of an ovarian cyst may become twisted. Torsion may be a gradual process or may be produced suddenly. Slow gradual torsion is not, as a rule, accompanied by acute symptoms but, through interference with the blood-supply, may so diminish the vitality of the tissues as to lead to degenerative changes and to render them peculiarly liable to microbic infections. Sudden torsion is accompanied by acute and urgent symptoms. Twisting of the pedicle is commonest with tumours of moderate size which have risen above the pelvic brim, but is not rare with smaller tumours, particularly teratomata, which are still in the cavity. Both cystic and solid tumours are liable to the accident. Slight torsion, such as commonly occurs when the tumour rises out of the pelvis, is gradual, persistent, and without symptoms. If the torsion be acute the blood-supply of the tumour is cut off and degenerative changes result. Atrophy of the pedicle may be so complete that the tumour loses its original attachment and obtains a new blood-supply through adhesions to the omentum or other viscera. The term 'parasitic' is applied to such cysts. The causes of sudden torsion of the pedicle are often difficult to trace. In some cases it follows trauma, a fall or a blow on the abdomen, but this history is seldom obtained: sudden forcible contractions of the abdominal muscles, movements of intestines, unequal growth of the constituent loculi of the tumour are all possible causes, but we do not know what relative importance should

be attached to each of these factors. Pregnancy and labour are amongst the commonest causes, for torsion of the pedicle occurs nearly thrice as often in association with these events as at other times. This question will be further discussed in the section dealing with ovarian cysts and pregnancy.

The degree of torsion varies from a twist through a quarter of a circle to one causing two or three complete turns of the pedicle; in exceptional cases as many as twelve complete twists have been counted. The direction is not constant: Freund

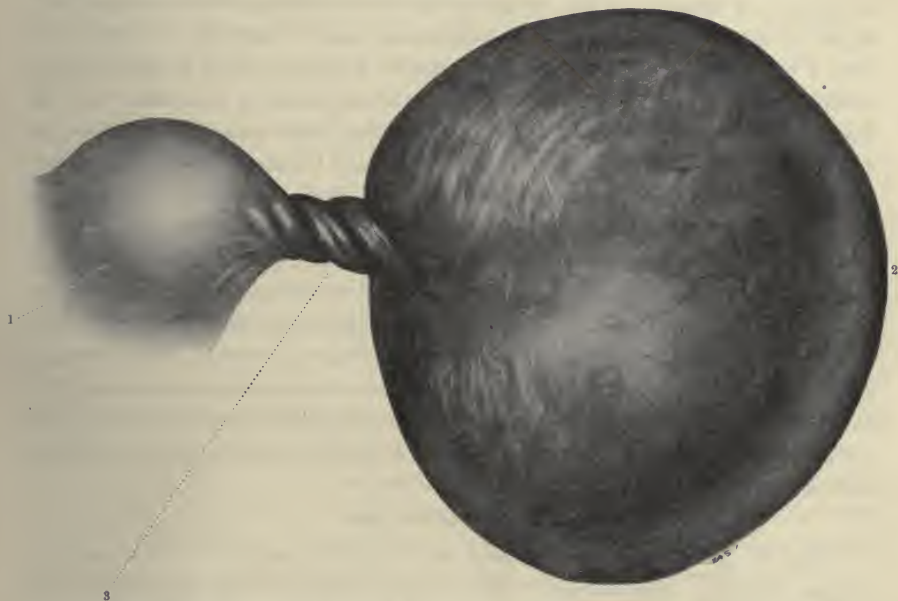


FIG. 443.—Torsion of the pedicle of an ovarian cyst: showing 1, the uterus; 2, the ovarian cyst; and 3, the twisted pedicle.

endeavoured to prove that right-sided tumours rotated to the left, and left-sided tumours to the right, but this 'law' has so many exceptions that it cannot be regarded as established. The effects upon the tumour vary according to the degree and rapidity of the torsion; when complete and sudden the tumour is enlarged from vascular engorgement and discoloured from effusion of blood into both cavity and cyst-wall. Haemorrhage and engorgement are more marked with a long thin pedicle than with a thick fleshy one. The thin veins are compressed and their channels obliterated, the thicker arteries are not occluded and continue to carry blood to the tumour. The appearance of the cyst is very characteristic; the walls

lose their white glistening look and assume a deep blue or purple colour. The tissues are invaded by micro-organisms, probably derived from the bowel, and invasion is followed by an acute inflammation of the tumour and surrounding peritoneum. When the torsion is less sudden and complete the effects upon the tumour are less marked, but degenerative changes and localized peritonitis, often leading to the formation of adhesions, are usually found.

Symptoms.—In rare cases there is a complete absence of all symptoms, and we are sometimes surprised to find at operations torsion of the pedicle where we little suspected it. The striking feature is pain, paroxysmal in character, becoming easier after a time, and recurring at longer or shorter intervals. In a typical case the patient is seized with a sudden severe pain in the abdomen associated with the symptoms of shock, subnormal temperature, and a feeble pulse; vomiting is not uncommon. The shock is greatest when there is much haemorrhage into the tumour. Soon the abdomen becomes distended and tender, the pulse-rate and temperature are raised, the tongue is furred, the movements of the abdomen are restricted and the symptoms are those of a localized or general peritonitis. After a time the abdominal distension subsides and the tumour can be felt on palpation; if its existence had been recognized previously to the attack it is often found to have increased in size from engorgement of vessels and effusion of blood. Niot in 1901 collected a series of cases in which torsion of the pedicle of a small ovarian cyst had been mistaken for appendicitis; in other instances it has been mistaken for rupture of an ectopic gestation sac, gall-stone, or renal colic, perforation of a gastric ulcer and intestinal obstruction.

Rupture of the Cyst

Rupture of an ovarian cyst may occur spontaneously or as the result of external violence. Spontaneous rupture is the commoner form and occurs most often in papillomatous cysts, probably as the result of atrophy and weakening of the wall from pressure of the intracystic growths. It is not uncommon with broad-ligament and thin-walled unilocular ovarian cysts, less common in pseudo-mucinous cyst-adenoma and teratomata. Spontaneous rupture is usually preceded by degenerative changes in the wall sometimes as the result of torsion of the pedicle. Clinically we recognize five groups of cases:

- (1) Perforation of a cyst containing papillomatous growth, followed by the detachment and escape of portions of the growth which, becoming implanted on peritoneal surfaces, give rise to implantation metastases and to ascites.

- (2) Rupture of a parovarian or thin-walled unilocular ovarian cyst with disappearance of the tumour and accumulation of free fluid in the abdominal cavity.

(3) Rupture of one or more loculi of a pseudo-mucinous cyst-adenoma with constant leakage into the peritoneal cavity, and sometimes with the escape of considerable masses of myxomatous material which form a thick envelope around the abdominal viscera.

(4) Rupture of a cystic teratoma with escape of its contents and the development of implantation metastases composed of 'dermoid' structures.

(5) Rupture of a suppurating cyst with the escape of pus into the peritoneal cavity and the development of a rapidly fatal peritonitis.

Rupture from violence may occur during a medical examination or from a fall or blow upon the abdomen. In such cases large veins in the tumour-capsule may be torn across, and severe, or even fatal, intraperitoneal haemorrhage take place. The signs and effects of the rupture depend in part upon the nature of the cyst-contents, and in part upon the rapidity with which they escape. The escape of small quantities of serous or myxomatous fluid causes no symptoms, and the accident may be discovered only at operation. The sudden escape of large quantities of fluid may be attended by profound shock and by violent pain, vomiting, and abdominal distension. If the contents be purulent, septic peritonitis develops. Changes are to be discovered in the condition of the abdomen, the tumour becomes smaller and flaccid or may disappear entirely, whilst at the same time there is dulness in the flanks, displaceable on change of position, indicating the presence of free fluid in the peritoneal cavity. If the fluid be thin and serous it is rapidly absorbed by the peritoneum and excreted by the kidneys and bowel—under these circumstances large quantities of urine may be passed; if thick and tenacious it is absorbed slowly or not at all, and, as already mentioned, may form a thick mucinoid envelope round the abdominal viscera. Implantation metastases following rupture of papillomatous, teratomatous, and pseudo-mucinous cysts have already been described.

Occasionally the cyst ruptures into one or other viscus. Ruptures into the rectum, bladder, small intestine, and vagina have all been recorded.

Inflammation of the Cyst

Inflammation is most prone to occur in cysts whose vitality has been lowered from torsion of the pedicle or from injuries received during labour. It occurs more often in small cysts occupying the pelvis than in larger ones situated in the abdominal cavity, and appears to be more common in teratomatous cysts than in those of other varieties. We are of opinion that the older statistics upon this last point may be misleading, for the appearances of the sebaceous fluid contents of

teratomatous cysts resemble those of pus, and it is often difficult, without a microscopical examination, to distinguish between the two.

Modes of Infection.—*The Intestine.*—The frequency of adhesions between the bowel and ovarian cysts suggests that in many cases the infective organisms gain entrance from the intestine. This mode of infection was conclusively demonstrated in a case of Martin's;¹ he found at operation a firm band of adhesion between the cyst and intestine, the band throughout its whole length contained the *Bacillus coli communis*. It is a noteworthy fact that this organism either in pure, or mixed, culture is to be found in the majority of suppurating ovarian cysts. It is possible, as suggested by Bland-Sutton, that the inflammatory changes may arise first in the gut itself, that as a result of such changes the bowel may become adherent to the cyst, and the organisms pass through its walls by direct continuity of tissues.

The Fallopian Tube.—The frequency and importance of infections of the Fallopian tube have only recently been recognized. That an ovarian cyst may adhere to an inflamed tube is a fact often observed, and, as already stated, one variety of tubo-ovarian cyst is formed by the gradual absorption of the walls between a hydrosalpinx and an ovarian cyst. Dense adhesions are often found in the neighbourhood of the tubal ostium, and an infection arising in this situation may spread to all parts of the tumour.

The Vermiform Appendix.—The anatomical relation between right-sided ovarian tumours and the appendix is a close one, for the mesentery of the appendix is directly continuous with the right broad ligament, and an intraligamentary cyst may burrow between and separate the two layers of the meso-appendix. With extraligamentary cysts it is not uncommon to find the appendix adherent to the cyst-wall; we recently removed an ovarian tumour to which the vermiform appendix containing a concretion was adherent.

Puerperal Infections.—The frequency of suppuration in ovarian cysts during the puerperium shows the important part played by labour in the production of this complication. In a series of 330 cases collected by McKerron suppuration had occurred in 30, or 9 per cent. It is not easy in any given case to determine whether the infection was through tears of the genital tract, from a septic uterus, or from the intestine after the vitality of the tumour had been lowered by bruising or by torsion of the pedicle.

Blood-Infections.—In systemic diseases of infective origin organisms may be conveyed to an ovarian cyst. Such infections have been found in general tuber-

¹ *Die Krankheiten der Eierstöcke.*

culosis and in typhoid fever. F. E. Taylor¹ records a case in which the typhoid bacillus, in pure culture, was found in the pus of a suppurating ovarian cyst removed from a woman who had twelve months previously suffered from enteric fever. In both general tuberculosis and typhoid fever lesions of the intestine are found, and it is possible that the infecting organism may be conveyed by direct contact rather than by the blood-stream.

Tapping the Cysts.—In the days when this operation was common and performed without antiseptic precautions suppuration was a not uncommon sequel.

The Infective Organisms.—The bacteriological examination of the pus from suppurating ovaries has been made only of recent years and in a comparatively small number of cases. The *Bacillus coli communis* in pure or in mixed culture is the organism most commonly present. *Staphylococcus aureus* and *albus*, *Streptococcus pyogenes*, *Proteus*, *Bacillus typhosus*, *Bacillus tuberculosis*, and anaerobic gas-producing organisms have also been found.

Adhesions.—Inflamed ovarian cysts contract adhesions to surrounding viscera and the parietal peritoneum. Peritoneum-clad surfaces of adjacent viscera adhere to the surface of the tumour which is often covered by a layer of coagulated lymph. If the adherent viscus remains at rest, as the layer of lymph becomes slowly converted into fibrous tissue a firm sessile adhesion is formed. If, on the other hand, movement takes place between the adherent surfaces, a fibrous band is formed which stretches from one to the other. Such adhesions are often vascular so that a tumour cut off from its original blood-supply by torsion of the pedicle may be fed by vessels reaching it from the omentum. The presence of adhesions, particularly when situated in the pelvis, adds to the difficulty and dangers of operation; they may further give rise to severe pain or lead to intestinal obstruction. Adhesions tend to fix the tumour and lack of mobility is the sign of greatest importance in diagnosis. If there be diffuse parietal adhesions the tumour will be immobile; partial adhesion to the anterior wall may lead to local retraction of the parietes. Intestinal adhesions are to be suspected when we find a soft ribbon-like band attached to some part of the tumour and particularly when over this band intestinal gurgling is heard.

Suppuration of an ovarian cyst is a grave complication. In some cases the symptoms are slight and there is an absence of both fever and pain. More often severe constitutional and local symptoms are present. The temperature rises, the pulse-rate is increased, the tongue becomes furred and dry, the patient suffers from profuse night-sweats, loses flesh, and becomes anaemic and cachectic. There is

¹ *Journal of Obstetrics and Gynaecology of Brit. Empire*, vol. xii.

obstinate constipation or, in some cases, diarrhoea with offensive stools, and the skin develops a yellow tinge. Unless relieved by operation the patient may die of septic intoxication, or the abscess may rupture externally or into one of the hollow viscera; in the latter event the patient often gradually sinks from the effects of the prolonged suppuration. The tumour is not necessarily tender so long as the peritoneal coat is not involved, but abdominal pain and tenderness are often marked features. A high degree of leucocytosis is found in some cases.

A suppurating cyst may rupture into the large or small intestine, the rectum, or the bladder. It may burst through the pouch of Douglas and the pus escape through the vagina, or may point beneath the anterior abdominal wall. The contents may be completely discharged and the sinus close, but such a termination is the exception. When a teratomatous cyst ruptures into the bladder its contents, hair and sebaceous matter, are discharged in the urine.

OVARIAN CYSTS COMPLICATING PREGNANCY, LABOUR, AND THE PUERPERIUM

Effects of the Tumour upon Pregnancy

Disease of the ovaries is undoubtedly a cause of sterility, but even when bilateral tumours are present, so long as any portion of the ovary remains capable of producing and discharging ova, it is possible for a woman to conceive. Ovarian tumours are not a common complication of pregnancy or labour. In a series of 17,832 consecutive labours in the Berlin Frauenklinik only 5 were complicated by ovarian cysts, and since such cases are likely to be sent into hospital for delivery, the frequency suggested by these figures is probably too high. McKerron¹ has collected and analysed a long series of cases, and the figures given in the following paragraphs are based upon his analysis.

Nature and Situation of the Tumour.—In McKerron's series the nature of the tumour was recorded in 862 instances, and of these 204 were 'dermoids.' The tumours were bilateral in 65 cases, but a number of these were evidently lutein cysts associated with hydatidiform moles. Solid tumours were rare, constituting rather more than 2 per cent. In the majority of cases the tumours were small or medium-sized, but some were sufficiently large to distend the whole abdomen. Labour is obstructed by small more often than by large tumours, for the latter usually occupy the abdominal cavity and leave the pelvis free. During pregnancy the ovary rises with the fundus uteri, but an ovarian tumour, because of its increased

¹ *Loc. cit.*

weight, or because it is fixed by adhesions or impacted beneath the promontory of the sacrum, may remain in the pelvis and obstruct labour.

Pregnancies complicated by ovarian tumours terminate in miscarriage or premature labour in 15 to 20 per cent of the cases. The accident is more common with large than with small tumours, and is particularly liable to follow torsion of the pedicle, inflammation of the cyst, or impaction in the pelvis.

Influence of Pregnancy upon the Tumour

We have no evidence that ovarian cysts grow more rapidly during pregnancy than at other times, but they are specially prone to complications.

Apart from pregnancy, torsion of the pedicle occurs in about 8 per cent of ovarian tumours, during pregnancy in 12 per cent, and in association with labour and the puerperium in 22·7 per cent. It is commoner with abdominal than with pelvic tumours. The greater frequency of torsion of the pedicle during pregnancy is probably due to the fact that the enlarging uterus exerts pressure on one part of the tumour only and so causes axial rotation. During labour it must be attributed to contractions of the uterus, and after delivery to the rapid diminution in the size of the uterus and to the movement thus imparted to the tumour as it returns again to the cavity of the pelvis.

Formation of Adhesions.—During the puerperium, and to a less extent during pregnancy, adhesions are formed between the tumour and adjacent viscera; they are sometimes the result of slight degrees of torsion of the pedicle and sometimes of degenerative changes in the cyst-wall.

Suppuration is more common during pregnancy than in the non-gravid state, but occurs in less than 2 per cent of the cases.

Rupture.—According to Sir John Williams ruptures occur in 3·5 per cent of tumours during pregnancy, and in 2·4 per cent in the non-gravid state. It is most often secondary to torsion of the pedicle with sudden distension of the cyst-cavity with blood. It may result also from necrosis of the walls or from tearing of adhesions by the enlarging uterus.

It is evident, therefore, that ovarian cysts are particularly liable to pathological changes when associated with pregnancy, indeed some complication is to be anticipated before delivery in one case out of every three. The accidents which befall the tumour endanger the life of the patient, and the presence of the ovarian cyst is to be regarded as a peril throughout the whole period of gestation.

Treatment of Ovarian Tumours complicating Pregnancy

The discovery of an ovarian tumour during pregnancy should, in the majority of cases, be followed by its removal as soon as possible. To this general rule there are exceptions which will be considered later. What is likely to happen if the tumour be left alone? This course was adopted in over half of McKerron's 720 cases and gave a maternal mortality of 21 per cent and a foetal mortality of over 30 per cent. Amongst 299 cases in the same series treated by ovariectomy the maternal mortality was 3·3 per cent, and amongst the uncomplicated cases the operation was followed by premature expulsion of the ovum in 11 per cent only. These figures, collected from many sources, indicate clearly the advantages of ovariectomy over non-interference. It matters little at what period of gestation the operation is undertaken, equally favourable results to both mother and child are obtained in the earlier and the later months. Two other methods of treatment were formerly practised but have now been generally abandoned, namely the induction of premature labour and tapping. Premature labour was induced in the hope of preventing those complications which were known to be common during pregnancy; the practice has been abandoned because it is now recognized that such complications are even commoner during labour and the puerperium, and because by inducing labour we sacrifice the child. Tapping gives results less favourable than those of ovariectomy to both mother and child; it is attended by risk of injury to the uterus and of suppuration in the cyst. It is still employed occasionally when ovariectomy is contra-indicated by the patient's general condition, where there are extensive adhesions between the cyst-wall and the uterus, or for the relief of distressing pressure symptoms. Ovariectomy should as a general rule be practised in the case of both large and small tumours, for both are equally liable to cause urgent symptoms, but exceptions may be made:

(1) In the case of bilateral ovarian tumours of small size, particularly in women who have no other children. If such tumours give rise to urgent symptoms they must of course be removed, but even then an attempt should be made to leave some ovarian tissue.

(2) In the case of tumours with extensive adhesions to the uterus operation should be deferred in the interests of the child until the last two or three weeks of pregnancy; in these circumstances it is sometimes necessary to perform Caesarean section.

(3) In the case of malignant tumours where the disease is too extensive for complete removal.

(4) In the case of lutein cysts associated with hydatidiform mole. Such tumours

become gradually smaller, and in time the ovary shrinks to its normal size after the expulsion of the mole.

The abdominal incision should be sufficiently long to allow of teratomata being removed entire. When difficulty is experienced in reaching a tumour situated in the pelvis, or in disengaging it from beneath the promontory of the sacrum, it may be necessary to enlarge the incision and to raise the uterus out of the abdominal cavity, turning it downwards over the pubes, before the tumour can be removed. In such cases the uterus should be wrapped in towels wrung out in warm saline solution. The pedicle should be ligatured as far as possible from the uterus, and the vessels should be tied separately. The liability to miscarriage is probably lessened by the administration of small doses of morphia for two days after operation.

Should the uterus be injured during removal of the tumour, the cut in the uterine wall may be sewn up and the pregnancy allowed to continue, provided the foetal membranes have not been punctured. If the membranes are punctured Caesarean section must be performed and the uterine contents removed.

Labour.—The effects produced upon labour by an ovarian cyst depend to a great extent upon whether it occupies the abdominal or pelvic cavity. If situated above the brim of the pelvis, labour may be prolonged because displacement of the uterus prevents the presenting part from entering the brim easily; more usually it follows a normal course. The tumour may rupture during delivery; torsion of the pedicle is more common and occurs during the third stage, when the diminished size of the uterus allows greater movement of the abdominal contents. Unless exceptionally large and tense it is not, as a rule, advisable to remove a cyst situated above the pelvic brim until after the completion of labour. It should, however, be removed early in the puerperium, preferably within twenty-four hours of delivery. A tumour in the pelvis is a more formidable complication and commonly obstructs delivery. In McKerron's cases "the total number of maternal deaths is 56, or 30·5 per cent. Of the children whose fates are noted, over one-half perished. The causes of this high maternal mortality are various but are nearly all referable to injuries sustained by the tumour during the process of labour." Of recent years, owing to improved methods of treatment, the maternal mortality has fallen to 5 or 6 per cent, and the foetal mortality to 20 per cent. The injuries to the tumour mentioned above include rupture, gangrene, and suppuration. In a few instances during strong pains the tumour has been forced through the recto-vaginal septum and expelled per rectum, or through the floor of the pouch of Douglas, and passed *per vaginam*.

Treatment.—There is no question that whenever possible the best form of treatment of a tumour impacted in the pelvis is its removal before the birth of the child.

If the tumour contain much solid matter it must be removed through an abdominal incision, if small or clearly cystic it may be removed through an incision in the posterior vaginal fornix. Many cases of successful vaginal ovariectomy during labour have been recorded, but the abdominal route is the safer and the one more generally employed. By the vaginal route it is often difficult to secure the pedicle and to deal with adhesions if they be present. After opening the abdomen the tumour is drawn through the wound and removed; it is sometimes difficult to displace it from the pelvis, and to accomplish this it may be necessary to enlarge the incision and bring the uterus out of the abdomen. If the tumour be densely adherent or very tightly impacted, Caesarean section may be necessary before its removal is possible, but this is exceptional. After removal, the delivery may be left to nature or assisted by forceps.

It is not always possible to perform abdominal section as soon as the tumour is discovered. Under these circumstances two courses are open: (1) to attempt to displace the tumour above the brim of the pelvis by the hand introduced into the vagina, (2) to tap or preferably make an incision in the tumour, evacuate its contents, deliver the child, and then remove the tumour by either the abdominal or vaginal route. Both these courses are open to grave objection—the former because of the danger of rupture of the cyst, the latter from the danger of infecting the peritoneal cavity. When in cases of necessity either of these courses is adopted, the removal of the tumour must follow at the earliest possible moment. Version, forceps delivery, or craniotomy should never be attempted in cases of labour obstructed by ovarian tumours.

The Puerperium.—If the patient escape the perils and dangers of pregnancy and parturition, she has still to face those of the puerperium. Torsion of the pedicle, gangrene, and suppuration of the cyst are more common during this period than at any other time. With a view to preventing these grave complications operation should be undertaken as soon as practicable after delivery of the child.

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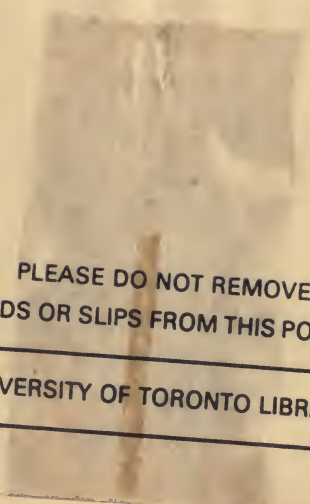
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